The Electrical Industry's Weekly Magazine

December 8, 1958

Electrical World

Price 50 Cents

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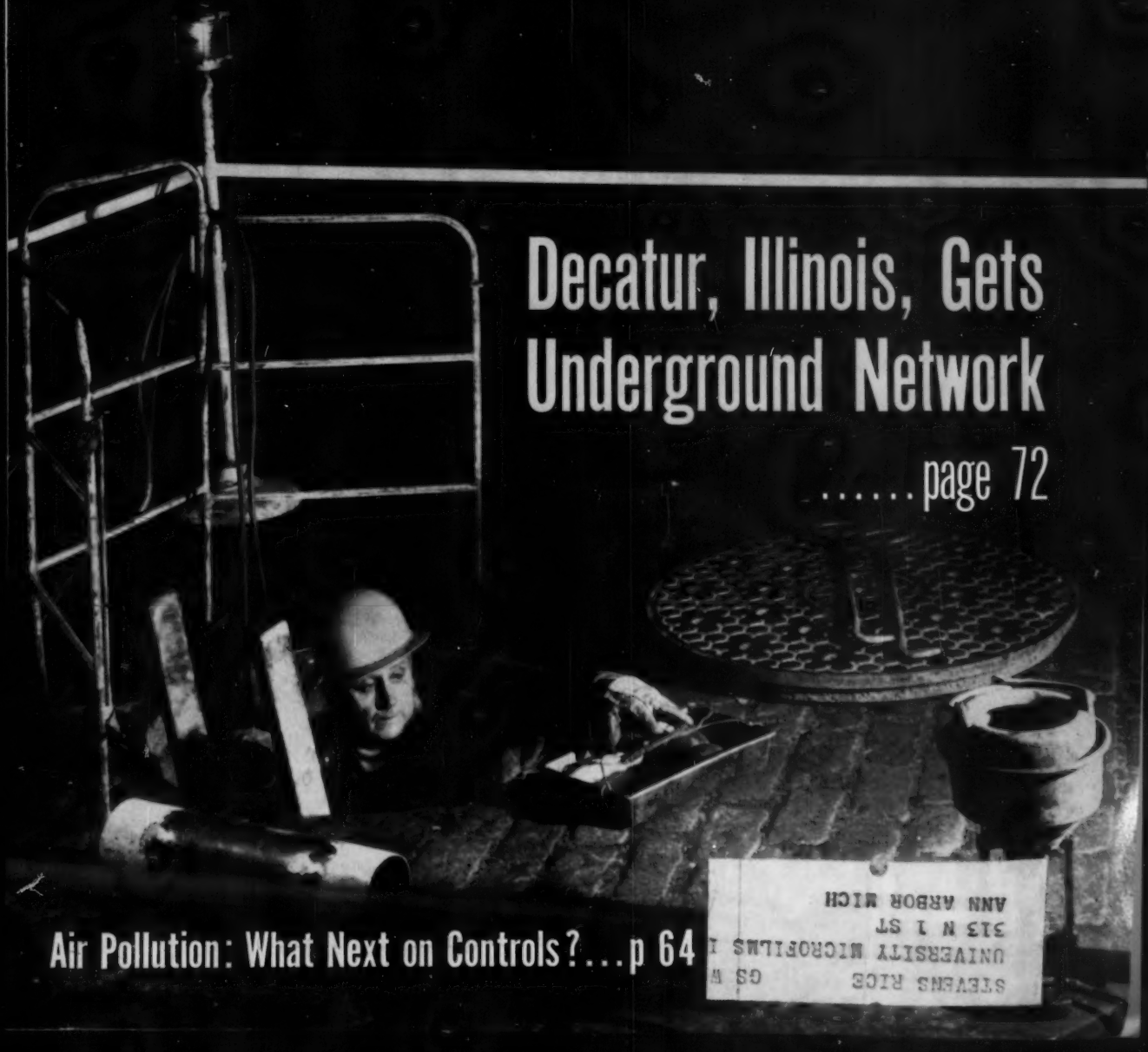

Decatur, Illinois, Gets Underground Network

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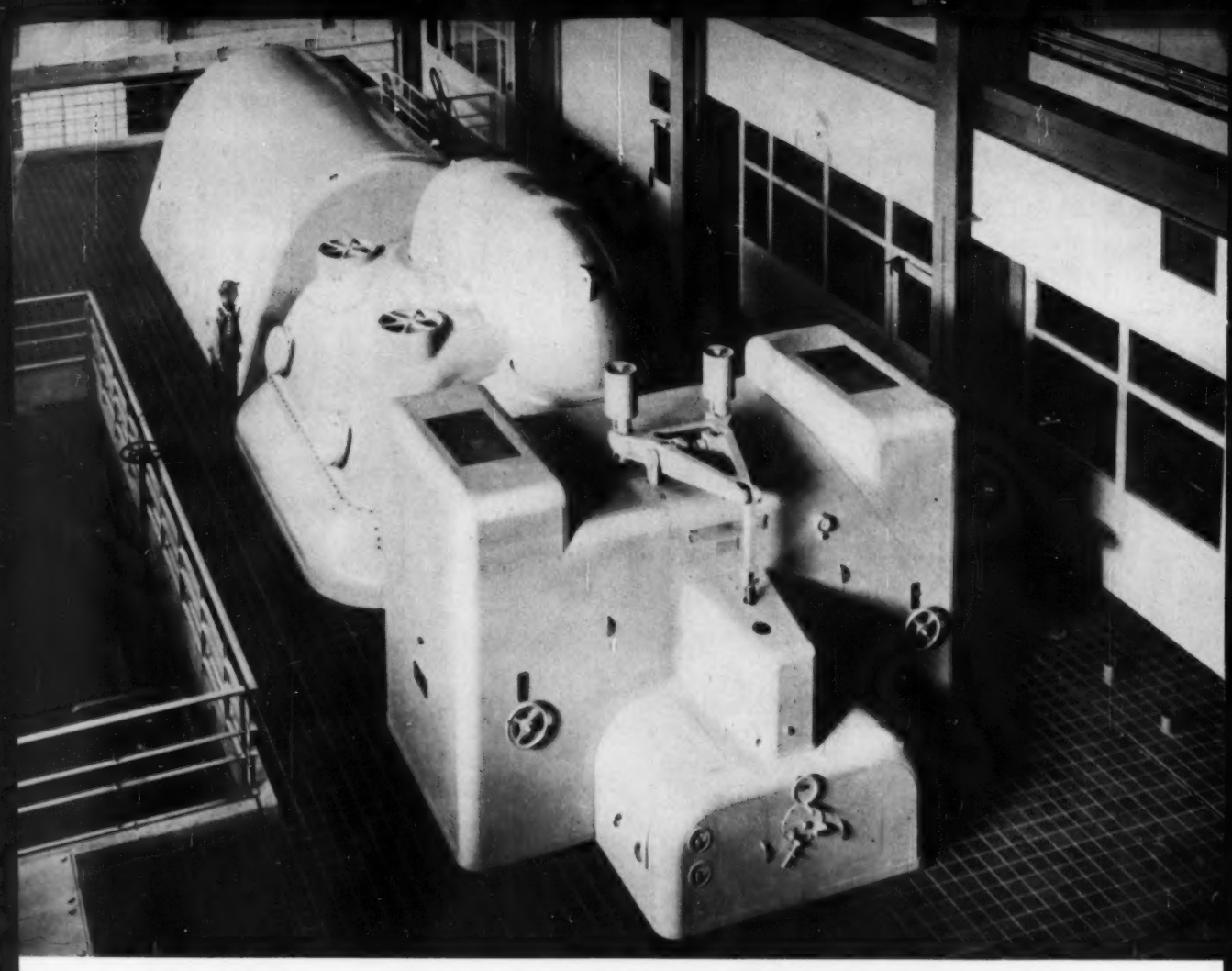

Get extra service life—extra protection with Texaco Regal Oil R & O

There's extra service built into Texaco Regal Oil R&O because it gives dependable protection against rust and oxidation as it lubricates. It's a first rate lubricant fortified with extra resistance to the formation of rust, sludge and foam.

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LUBRICATION IS A MAJOR FACTOR IN COST CONTROL

(PARTS, INVENTORY, PRODUCTION, DOWNTIME, MAINTENANCE)

Electrical World

Vol. 150, No. 23 DECEMBER 8, 1958

Published for 84 years for those engaged in the business of generating, transmittting, distributing, or applying electric power

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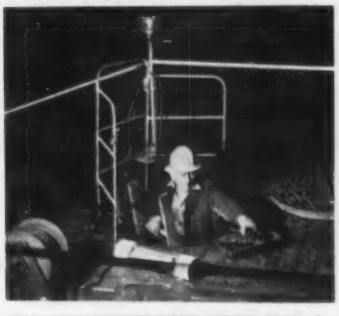

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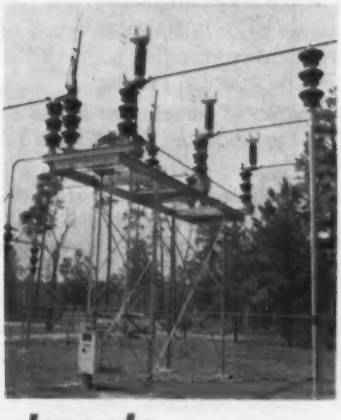

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Pressure-Tube Reactor Unlimited in Size

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Carolinas Virginia Nuclear Power Associates plan to use pressure tubes and heavy water for coolant and moderator.p 70

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Computer Solves DC Load Flows

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Bonneville engineers develop program with direct solution printout on system diagram; work usually done on analyzer.p 75

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Tubes, SF_6 Switch 115-Kv Substations

Hugh B. Balfour, Jr, Louisiana Power & Light Co

Louisiana P&L finds that new interrupters perform satisfactorily and are economical for capacitor applications...p 78

Improved Peaking Power with Air Storage

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Academic study indicates underground caverns can store large amounts of compressed air for peak-load use.....p 76

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Slam it closed "blind"...

this cutout never misses!

The lineman doesn't have to steer the fuse tube into the contact of S&C's XS Cutout

If the lineman closes into a *fault* and misses—where is the lineman?

If he closes into a *load* and misses—what can the lineman do?

Even an experienced lineman shouldn't be expected to steer a cutout closed; for safety's sake, he must look away.

For positive steering when closing, the fuse tube of S&C's XS Cutout is controlled in four ways:

(1) The tube trunnion is thrust firmly forward into pockets in the hinge by the contact springs.

(2) The tube trunnion is simultaneously stabilized by the hinge's inner surfaces acting on the vertical faces of the trunnion casting.

(3) At the same time, guide edges of the hinge steady the corresponding edges of the lifting eye in the tube trunnion casting.

(4) LOADBUSTER® attachment hooks act as guides to steer the fuse tube as it "wipes in" and seats positively.

These four elements provide certain closing action, even when slammed home blind. And on dark and windy nights, closing is a sure thing, without hang-ups or damage.

For full information about the XS Cutout and its use with LOADBUSTER for load switching, write for Bulletin 511 to S&C Electric Company, 4421 Ravenswood Ave., Chicago 40, Ill. In Canada: S&C Electric Canada, Ltd., 8 Vansco Road. Toronto 14, Ont.

S&C DISTRIBUTION CUTOUTS

Disconnects • Cutouts • LOADBUSTER® • Interrupters
Metalclad Switchgear • Fuse Links • Power Fuses

Solution for Air Pollution

Exhaust fumes from automobiles and trucks are now being pointed out as possible cancer-producing agents. The article from which this thought came gave traffic exhausts equal responsibility with cigarettes.

We have no intention of entering into this medical controversy since we have a sufficient number of problems in the electrical industry to keep us busy.

However, it has occurred to us that if we could fill the streets with electric automobiles, trucks, and buses, the potential health hazard from traffic exhausts would be eliminated.

The electric car is probably the most economical means of transportation available. Electric trucks and buses should come close to competing economically with gas or diesel operated units.

Our problem is to remove the inconvenience of the recharging cycle which limits mileage. Service stations would be essential but we also need batteries with more capacity. Is it worth an industry-wide research activity?

Fischer Black

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ABP **ELECTRICAL WORLD**

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Available with pushbutton platform controls, too

Push a button and the new Holan Series 2600 Ladder goes up; push another button and it comes down. The pushbutton station is on the mast—and a station can be installed on the upper side rail for the man on the platform.

Pushbutton control is just one operating feature. For precise spotting, you have a needle valve with a long handle that enables you to accurately guide the ladder down. You rotate with a crank located directly behind the ladder; this provides a better view for spotting, avoids left-hand cranking and gives maximum clearance between body wall and ladder. And, you crank the fly ladder out *and in* with a windlass.

Important non-operating features include: light-but-strong tubular support frame; heavy duty ladder hooks that engage two rungs at a time; optional protective fiberglass covering on side rails; and optional metal rungs. Heights to 32 feet, 360° rotation, 72° elevation.

Write . . . or talk with a Holan Field Representative.

J.H. HOLAN CORPORATION

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CLEVELAND 35, OHIO

OTHER PLANTS: **HOLAN CORPORATION OF GEORGIA**, Griffin, Ga.
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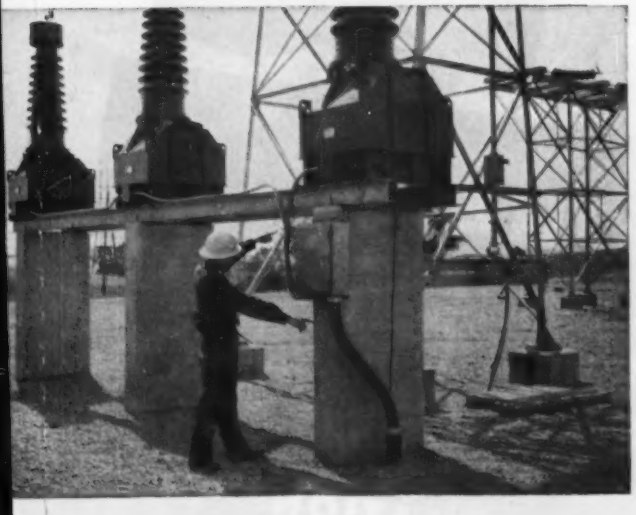
THE NAME THAT MEANS WORK SIMPLIFICATION



1 Sealtite—installed at Perry, New York, substation, New York State Electric & Gas Corp., on supervisory carrier current control equipment. **2** Sealtite is also used between 115,000 volt potential transformers and cabinet, and between cabinet and underground conduits. It speeded installation materially. **3** Connecting automatic forced air cooling to 15,000 Kva transformer bank, Sealtite absorbs movement set up by vibration of the equipment. No cracked or damaged conduit here!

"Sealtite solves a lot of problems at substations"

reports Mr. Leon Wheaton, construction and maintenance foreman, New York State Electric & Gas Corporation

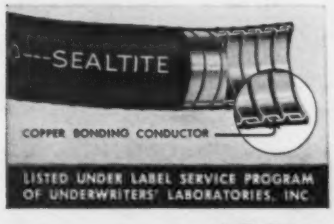
"It's twice as fast to install as rigid conduit—and it really stands up under heat, wind, rain, snow and ice."

Sealtite* flexible, liquid-tight conduit resists the weather and corrosive conditions that often knock out ordinary metal conduit. Wiring can't be damaged. Protection is complete. That's one reason more and more utilities across the country are using this unique conduit in plants and substations.

Also—flexible Sealtite saves the time and expense of planning, cutting, cornering and fitting rigid conduit. Installations are faster. Sealtite takes up movement, vibration . . . makes a neat appearance . . . facilitates the replacement of motors and other equipment.

WHERE TO GET SEALTITE—Electrical Wholesalers stock Types U.A. and E.F.† Sealtite in easy-to-handle coils, in black or gray. Be certain you ask for and get the quality conduit marked "Sealtite" on the cover. Buy it in long lengths on reels or in cartons and cut it on the job without waste. Your wholesaler also stocks liquid-tight connectors. Free Booklet S-538 gives full information on Sealtite. Write: The American Brass Company, American Metal Hose Division, Waterbury 20, Conn. In Canada: Anaconda American Brass Ltd., New Toronto, Ont. Sealtite is approved by Canadian Standards Association.

*Trademark †Pat. Applied For 57182 Rev.



CUTAWAY SECTION of Type U.A. Sealtite shows tough polyvinyl jacket over flexible metal core. Copper conductor wound spirally inside conduit gives positive ground.

Insist on the conduit marked **SEALTITE®**

flexible, liquid-tight conduit

an ANACONDA® product

MOLONEY

DISTRIBUTION TRANSFORMERS OFFER

LOWER LOSSES

LOWER EXCITING CURRENT

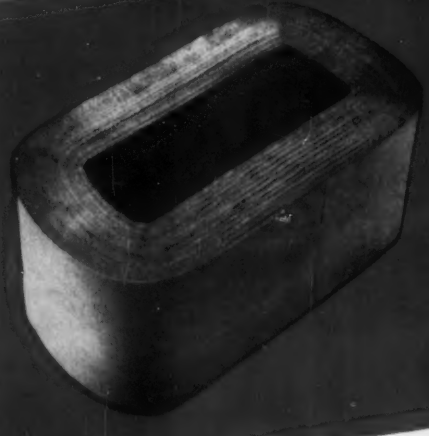
LOWER IMPEDANCE

IMPROVED REGULATION

BECAUSE . . .

CORE

These distribution transformers have the entirely new MOLONEY CORE. In this core a low reluctance path for the magnetic lines of force is provided by bridging the cuts in the laminations, resulting in substantially lower exciting current.



COIL

The coils have lower impedance to provide a lower internal voltage drop at all loads. This means that during peak load periods Moloney's distribution transformers can carry higher overloads at the same permissible regulation.

Redesign of the entire line of Moloney Distribution Transformers has brought about significant improvements in the mechanical design and in the electrical performance.

Inside . . . and outside . . . Moloney Distribution Transformers are designed and built for long, efficient, and economical operation. Specify Moloney Transformers . . . All Along The Line.

ME58-33

BUSHINGS

The bushing configuration provides liberal creepage distance without excessive height and gives the porcelain high impact strength. All bushings are internally clamped and all gaskets are completely retained.

CORE-AND-COIL UNIT

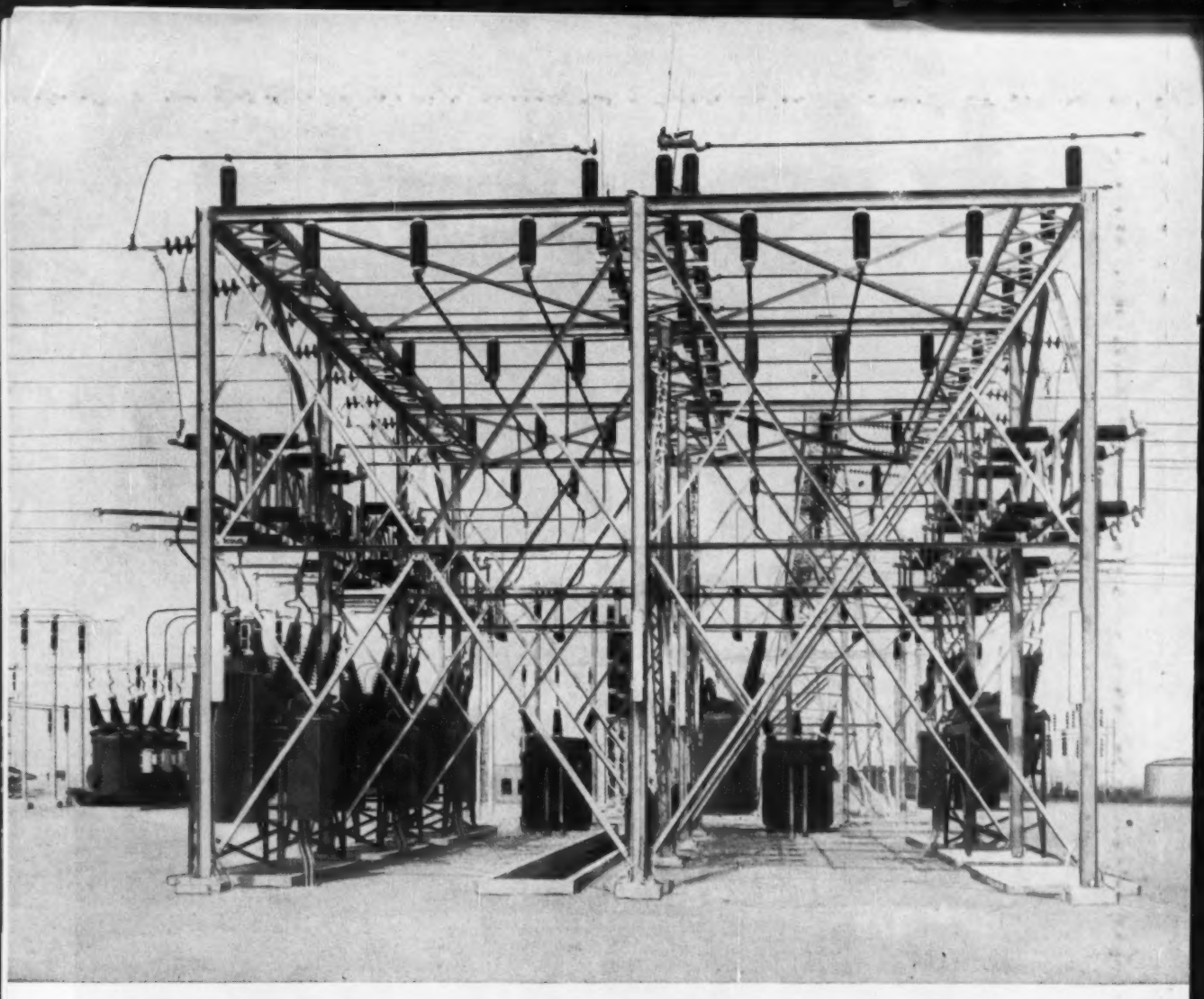
A new core-and-coil framing structure and strong, adequate blocking keep the core-and-coil in the proper position even under short circuit conditions.

Manufacturers of Transformers for Utilities, Industry, and Electronic Applications

MOLONEY ELECTRIC

MOLONEY ELECTRIC COMPANY

SALES OFFICES IN ALL PRINCIPAL CITIES • FACTORIES AT ST. LOUIS 20, MO., AND TORONTO, ONT., CANADA



SINGLE-SOURCE SUBSTATION PACKAGE

assures totally-integrated, economical installations

Speeding installation...saving you time and trouble...assuring top quality construction throughout – Federal Pacific stands ready to meet *all* your switchgear requirements in a single operation. The advantage: one order, one equipment manufacturer, unified control.

From initial engineering service to the completed installation–one plan guides the entire project to simplify purchasing, provide more accurate cost control and eliminate unexpected "hidden costs". And more important, when you buy the complete package from Federal Pacific you are assured a completely integrated installation. Each component is engineered to insure trouble-free, smoothly integrated operation.

With more than 50 years of experience in this field...with installations throughout the world...with a steady flow of repeat orders indicating satisfied acceptance–Federal Pacific is equipped to meet all your switchgear needs from beginning to end. Federal Pacific Electric Co., 50 Paris Street, Newark 1, N. J.

FEDERAL FPE PACIFIC

Better Products to Control Electricity

The Electrical Week

FUTURE NEWS ▶ **Look for soft coal price hikes** as a result of the $2-a-day pay raise miners will begin collecting in January. The situation parallels that of two years ago; and coal costs will probably jump about $100 million a year, for electric utilities.

LATE NEWS ▶ **A public utility anti-strike bill will be introduced** in the Alabama legislature this session, according to Rep M. B. McLendon.

Labor notes . . . Gulf States Utilities and Independent Electrical Workers Union agree to a 3½% wage hike . . . Florida Power Corp settles with its union on a 5% wage increase.

Columbus & Southern Ohio Electric asks Ohio PUC for rate increase of $3.4 million a year. This amounts to $1.6 million after taxes.

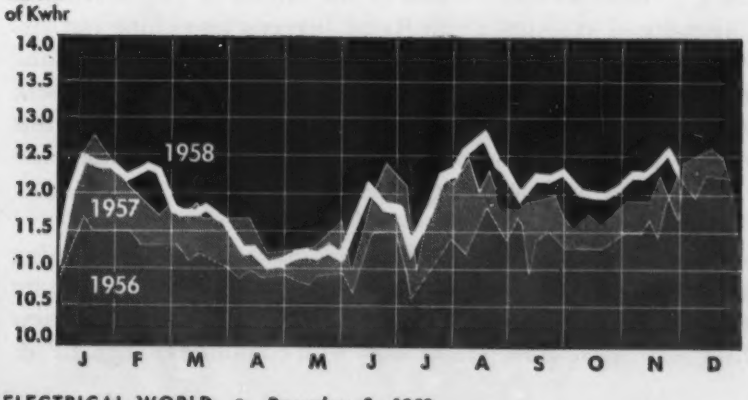
September '58 net income for all U. S. private utilities up 10.5% over Sept. '57, says FPC. Revenues up 6.4%; expenses only 5.4%.

Three water-balance maps are now available. In five colors, size 21 x 19 in., they show potential evapotranspiration, water surplus and deficit for eastern North America, from James Bay to Gulf of Mexico. Write: Resources for the Future, 1145 19th Street, Washington 6, D. C. Price is $2.00.

Ordinance permitting equipment purchases by negotiation rather than competitive bidding sought from Cleveland City Council by Utilities Director B. J. Klementowicz.

Management changes . . . Duke Power makes G. G. Mattison manager of operational engineering . . . F. W. Kearney retiring at James R. Kearney Corp Dec. 31, but will remain as sales consultant . . . Chase Brass & Copper makes G. R. Boutin vp, operations, succeeding W. L. Smith, new assistant to the president.

POWER OUTPUT—UP 5.7% (Week ending Nov. 29), Kwhr 12,274,000,000



Per Cent Change From Previous Year

	Nov. 15	Nov. 22	Nov. 29
Total U. S. ...	+3.6	+3.7	+8.7
New Eng.	+7.1	+8.6	+9.5
Mid. Atlantic..	+3.2	+3.3	+4.0
Cent. Ind.	+2.4	+1.5	+6.1
West Cent. ...	+3.3	+3.2	+7.0
Southeast	+1.7	+1.5	+4.1
South Cent. ...	+9.3	+8.2	+8.2
Rocky Mount...	+8.1	+7.0	+5.6
Pacific			
NW	+1.2	+4.1	+4.5
SW	+6.1	+8.5	+7.9

Seasonally Adjusted Index 241.3

Week Ago 237.1 Year Ago 227.6

Source: Edison Electric Institute

A TWO-MINUTE PREVIEW OF THIS ISSUE

EVENTS ▶ **Stricter air pollution controls may be coming,** judging from the speeches and comments at the recent First National Conference on Air Pollution. The general impression among most utilitymen attending the Washington confab is that the majority of delegates want these controls to be kept at the local level (p 64).

New York State Power Authority's bid for an A-power role is based on its contention that its future must be "dynamic, not static." For some of NYSPA's specific recommendations, see p 66.

Importation of electrical equipment is in the news again. Allis-Chalmers lodged a vigorous protest with TVA's board of directors against the anticipated purchase of three water-wheel generators for Wilson Dam. A-C contends the bid specs favored foreign manufacturers. Brown-Boveri got the job (p 68).

Sen Neuberger's new Columbia River Development Corp bill is getting a going over Dec. 8 in four states—Washington, Idaho, Oregon and Montana. Bill has been interpreted as being softer and tougher on private utilities, depending on the clauses you read (p 67).

DISTRIBUTION ▶ **Changing an overhead radial system to an underground network** was the distribution problem faced by Illinois Power Co in downtown Decatur, the company's largest metropolitan community. The switch was made necessary by increased congestion of the overhead system and the need for more capacity to meet load growth. The problems and solutions in this week's cover story are set down in detail on p 72.

GENERATION ▶ **Unlimited size is the main advantage of a pressure-tube reactor.** A pressure-tube, heavy-water moderated and cooled reactor, approved in concept by AEC and JCAC, is being designed by Carolinas Virginia Nuclear Power Associates, Inc. CVNPA and AEC are negotiating a contract on the first three steps of a program that will eventually lead to a commercial A-plant rated at 200 Mw (p 70).

Air stored in an underground cavern can improve peaking capacity, according to Dean Kenneth Razak of the School of Engineering at the University of Wichita. Dean Razak suggests smoothing out system load curve by splitting a gas turbine into its components parts, driving the compressor with an electric motor during off-peak periods to store compressed air underground, and then feeding this compressed air back through the turbine's combustion chamber and rotor during peak-load periods (p 76).

SUBSTATIONS ▶ **Two new methods for switching 115-kv capacitor banks,** one using vacuum tubes and the other sulphur-hexafluoride interrupters, are being tested by Louisiana Power & Light Co. Thus far the new switching methods operate satisfactorily with economic savings. LP&L

began investigating these switches to fill the gap between the air-break switch and the oil circuit breaker. Findings on p 78.

SYSTEM ENGINEERING ▶ **A digital computer is being used to solve dc load flow problems** at Bonneville Power Administration. The computer solves the same set of equations usually handled by an ac network analyzer. It is said to provide a relatively fast, though partial, solution. Only power flow and approximate bus power angle are obtained (p 75).

MANAGEMENT ▶ **What are the chances for economic depreciation?** Practical reality of pinning depreciation charges to the value of the dollar seems remote, as Democratic election victory dims prospect for recognizing economic depreciation as a tax deduction. But interest in the plan is expected to grow as inflation continues. ED's prospects are covered in the third and last article of a series . . . p 99.

MANUFACTURERS ▶ **Mergers make the big manufacturers' news this week.** Allis-Chalmers disclosed plans to acquire S. Morgan Smith Co through an exchange of 1.1 shares of A-C common for each share of Smith common. I-T-E Circuit Breaker has acquired Wilson Electrical Instrument Co of Houston, Texas, by offering 8,820 shares of I-T-E common for all outstanding Wilson common. General Controls will purchase the assets of Foster Engineering Co, Union, N. J., subject to stockholders' approval . . . Griscom-Russell Co's three evaporators built for American Electric Power's Breed and Sporn Stations exchange heat at about 24.5 million Btu per hr (p 86).

NEW EQUIPMENT ▶ **Transformers for underground systems are pad-mounted,** enabling utilities to achieve an aesthetically pleasing transformer installation wherever appearance is important . . . Repeater station for land-mobile communications systems allows cross-over of frequency bands . . . Guy anchor is designed for greater strength than the guy rod . . . Motors are UL-approved for Class I Group D and Class II Groups F and G explosion-proof service (p 92).

SELLING ▶ **Washington Water Power is selling sun-switched barnyard lights** all over its service area. Each of the 295-w lights is good for about $15 EAR. WWP goal is to sign up 10% of its rural customers—about 1,000—in the next 2½ years. GE has new office lighting facility at Nela Park to prove good office lighting pays its way (p 104).

PEOPLE ▶ **New Atomic Industrial Forum president is Francis K. McCune,** vice president and general manager of General Electric Co's Atomic Products Division. Reelected vice president of the Forum was E. W. Mills of Foster Wheeler Corp. Other Forum vp's and directors on p 106 . . . Commonwealth Services, Inc, has elected J. R. North president and C. D. Birget and F. R. Sanford vice presidents. M. C. Westrate is named new Commonwealth Associates director (p 106).

Heat pumps heat and cool an office building for less than the former annual cost of steam heat, according to "Electrical West". Wiring capacity of the 35-year-old Los Angeles building was boosted by using the old steam pipes as raceways for 3-ph circuits to serve 318 1-hp reverse-cycle units throughout the building.

TECHNICAL NOTES

Rate of rise of back voltage and magnitude of current surge at the instant of ignition in mercury-arc rectifiers for dc transmission is reduced through use of damping devices and high-frequency reactors. Reactors connected in the rectifier's plate circuit reduce radiation and lower RI to a tolerable level.

Amount of carbon formed when an energized breaker opens depends on current interrupted, speed of contact opening, and type of contacts.

Spacers which do not link bundled conductors rigidly attenuate the tendency for conductors to twist due to sudden removal of ice load.

Electrostatic recording at 30,000 characters per sec is a feature of a new teleprinter. If the paper could be moved fast enough, recording speeds at least 20 times faster could be attained.

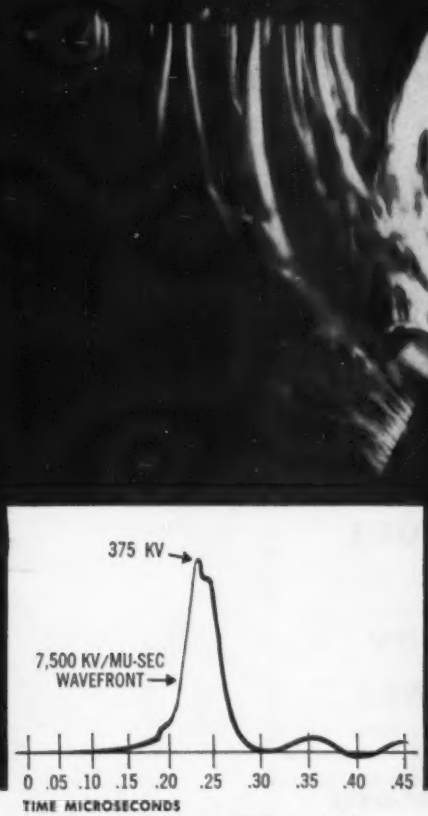
Incremental maintenance cost used in economic dispatch should reflect in the cost rate the varying use of boilers and turbines in non-unit design plants.

If the boiler feed pump is placed after the last heater, the cycle gets the benefit of the temperature rise in the feedwater due to the work of the pump. This arrangement permits the highest pressure bleed to be dropped as much as 15-20 psi with no change in final feedwater temperature.

FROM EDITORS IN THE FIELD

Concrete walls of hydro races may be kept free of moss and liverwort through application of 2-5% by weight of copper pentachlor phenate, report engineers of the Australian State Electricity Commission. Test panels are free of plant growth after five years' exposure.

After this, lightning looks easy



Oscillogram of steep-wave flashover of O-B distribution post. In addition to seven-inch model (below), O-B has a nine-inch post which has withstood similar flashovers.

O-B distribution post withstands ultra-steep waves of .05 microsecond front

If you want protection against lightning damage built right into the insulators for your next distribution line (up to 25 kv), take a good look at the O-B distribution post.

We've just seen new evidence of its ruggedness. With the help of new testing techniques and of new instrumentation, the O-B high-voltage laboratory has produced ultra-steep wave fronts of .05 microseconds and under (remember when a 1½ microsecond front was considered a severe discharge?). Rate of rise of the wave is 7500 kv per microsecond.

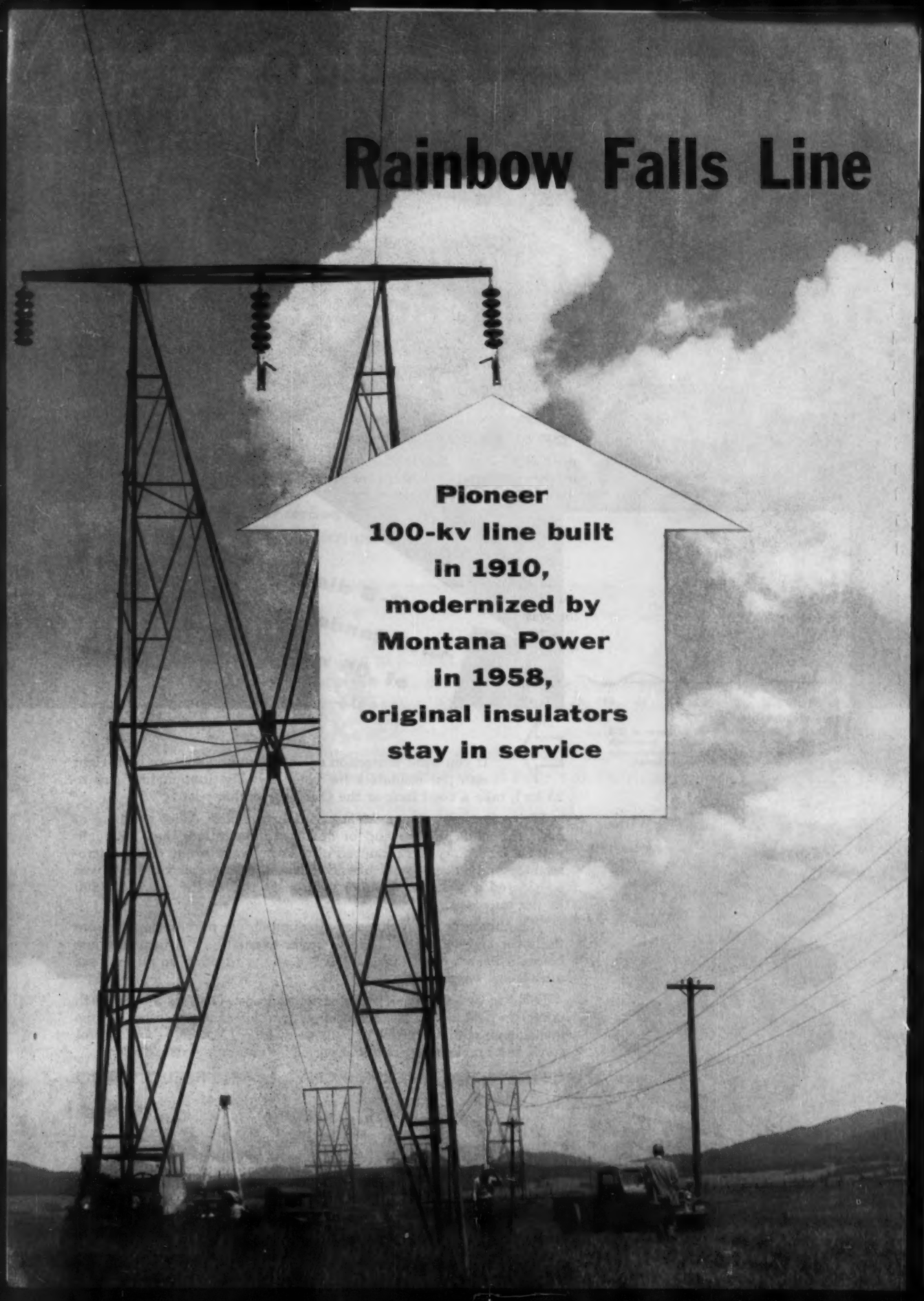
The photograph was taken approximately .01 microseconds *before* flashover and shows the extreme stress exerted on the insulator just before it flashes over — visual proof of ability to stand up under these ultra-steep waves.

O-B has two models of this distribution post. One has a seven-inch porcelain height with 11 inches of leakage distance; the other is nine inches high with 15 inches of leakage distance. You have a choice of studs and brackets to provide a variety of mounting arrangements.

OHIO BRASS COMPANY, MANSFIELD, OHIO

Ohio Brass

4952-H


Rainbow Falls Line
Pioneer
100-kv line built
in 1910,
modernized by
Montana Power
in 1958,
original insulators
stay in service

Makes Transmission History

History - -

In 1805 Captain Meriwether Lewis of the Lewis & Clark expedition christened one of the series of falls in the head waters of the Missouri River "Rainbow Falls." In 1910, two parallel, 100-kv transmission lines were built from Rainbow Falls over 130 miles of mountainous and semi-mountainous terrain to Butte, Montana. A single line continued for 22 miles to Anaconda. Rainbow Falls was the second transmission line in North America to use the O-B one-piece porcelain, cap-and-pin suspension insulator.

Performance - -

EHV OF 1910 PROVES PRACTICAL

The Transmission Department of Montana Power Company (then Great Falls Power Company) soon learned that operating a 100-kv system was no more difficult than 50-kv had been. The line proved basically trouble-free, providing a dependable power supply for Butte and Anaconda.

Modernization - -

LINE CAPACITY INCREASED IN 1958

To increase capacity of the line from 35-mw to 60-mw, it was decided to reconductor the Rainbow Falls lines in 1958. The original 1/0 hemp-core copper conductor was replaced with 336.4 MCM ACSR. Realizing that increased conductor loading would encroach on the safety factor in some areas, Montana Power relocated some towers and built intermediate towers where loading after reconductoring indicated more tower strength was needed. During reconductoring, old insulator strings on hold-down structures and in strain positions were changed over to modern units. But the rest of the insulators from the 1910-13 period - - almost 88 per cent of the total - - remained in service.

The Line Today - -

STILL A VITAL PART OF MONTANA POWER SYSTEM

Rainbow Falls remains an important power supply to Butte and Anaconda. But in 1910 the Montana Power system peaked at 50,000 kw. Today the peak is 540,000 with a system capability of 671,000. Top transmission voltage has risen to 161-kv, with 551 miles of 161-kv line criss-crossing the Company's 90-thousand-square-mile service area. After Rainbow Falls, another 1016 miles of 100-kv line were added to the system. Through the years, O-B suspension insulators have been highly regarded by the Montana Power Company . . . the result of a precedent established by their reliable performance on the pioneer line of 1910.

OHIO BRASS COMPANY, MANSFIELD, OHIO

Canadian Ohio Brass Co., Ltd., Niagara Falls, Ont.

Ohio Brass

4885-H

This 16.5 KV 3" diameter cable, manufactured by The Okonite Co., Passaic, N. J., is capable of carrying more than 3,500 kva. The power conductors have 270 mils of high molecular weight ALATHON as primary insulation, layers of semi-conducting tape and shield of untinned copper tape over each conductor. The three control pairs are also insulated with ALATHON. The conductors are cabled with jute fillers and armored with galvanized steel. The entire construction is jacketed with 90 mils of yellow ALATHON polyethylene resin.

used for submarine cable

Okonite constructs unique cable to supply power and electrical control to offshore drilling rig

Du Pont ALATHON polyethylene resin played an important part in the construction of the two and one-half miles of submarine cable recently laid from Santa Barbara, Calif., to the first Pacific offshore oil drilling platform.

The Okonite Company used ALATHON as the primary insulation for the cable's three power conductors and three control wires and for the outer jacket over the entire construction. It was used for several reasons. For example, the extremely low power factor and dielectric constant of ALATHON assure low dielectric loss. Power conductors insulated with ALATHON, therefore, have a greater load-carrying capacity than those insulated with other materials. Secondly, the excellent impermeability of ALATHON assures low moisture absorption, only 0.014% (by A.S.T.M. D570-42).

The use of ALATHON for the sheath as well helped keep costs of the bright yellow cable in line. Colored yellow, instead of the usual black, the cable will be easy to distinguish from pipelines and hoses in the area.

WRITE FOR FREE BOOKLET. The latest information on Du Pont insulating and jacketing materials for wire and cable is available in a sixteen-page booklet. Just ask for "WC-1 booklet." Write E. I. du Pont de Nemours & Co. (Inc.), Polychemicals Department, Room 1512, Du Pont Building, Wilmington 98, Delaware.

POLYCHEMICALS DEPARTMENT

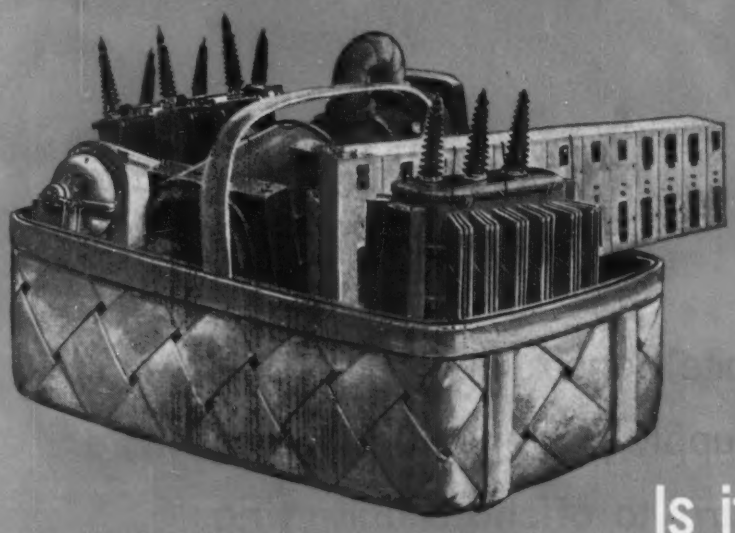
ALATHON®

POLYETHYLENE RESIN

DU PONT

REG. U.S. PAT. OFF.

BETTER THINGS FOR BETTER LIVING . . . *THROUGH CHEMISTRY*



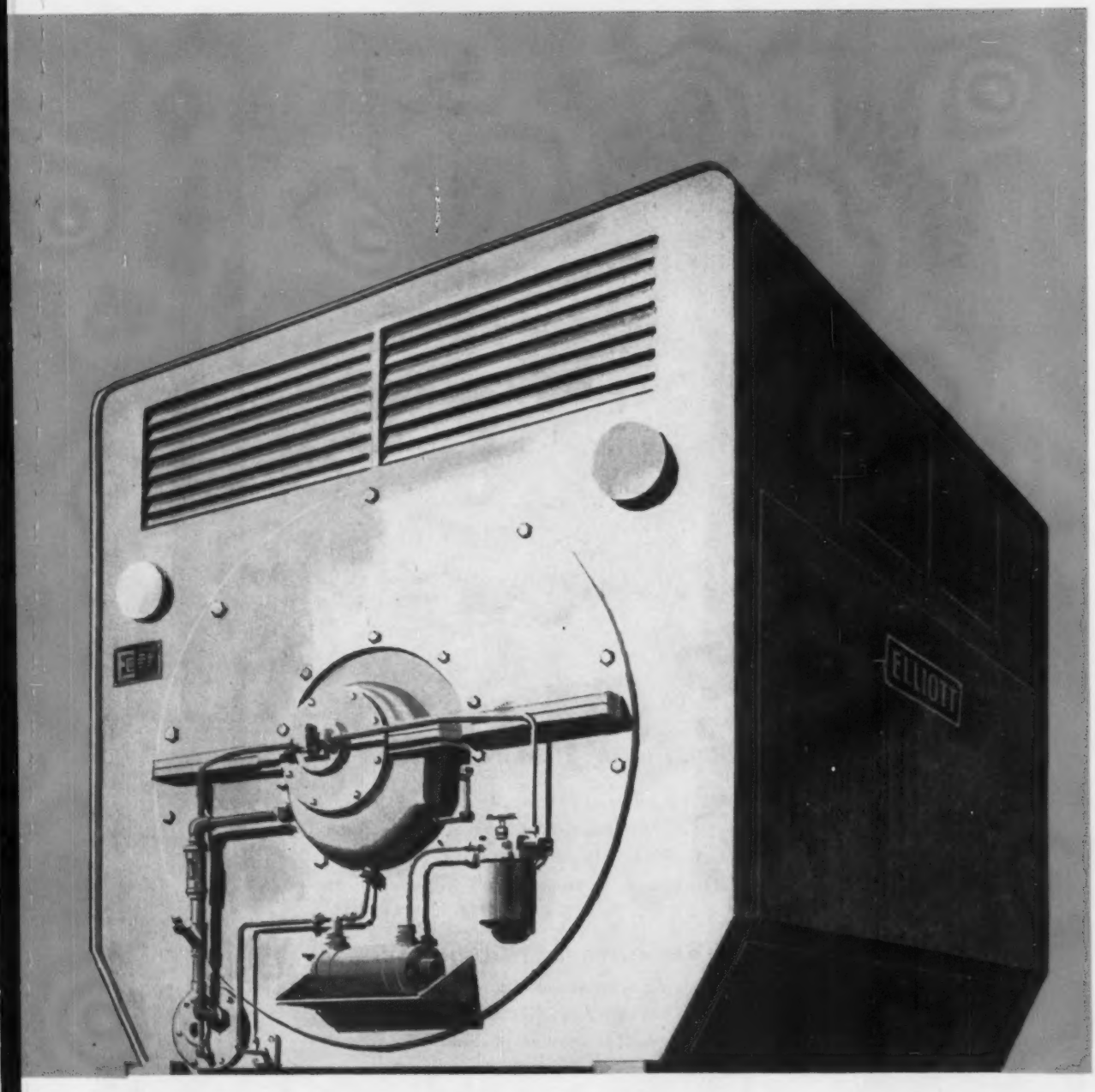
Is it wise to risk "MARKET-BASKET" buying when selecting boiler-feed pump motors?

YOUR MOST IMPORTANT AUXILIARY SHOULD BE THE BEST YOU CAN BUY

Just any large motor won't do. Since the boiler-feed pump motor is your most important auxiliary, it should be the very best you can find. That's why it pays to ask yourself . . . does "unified responsibility" (or market-basket buying) really assure me of the best units? . . . will this plan give me the *best* large motor I can buy? . . . is this the way to get the best engineered drive? . . . *am I really getting a bargain* if my most important auxiliary gives me less than the best in long life and uninterrupted performance?

Elliott leadership in large powerhouse motors is based upon its fabulous record of repeatedly building the largest and best 2-pole motors in the industry . . . its introduction of the first super-quiet motor in the 5000-hp size . . . its engineered functional "Fabri-Steel" frame design . . . its many types of enclosures . . . its ease of access to bearings and internal parts . . . and its outstanding 8-year "Fabri-Seal" insulation field service record without a single failure. For complete details, write Elliott Company, Ridgway Plant, Ridgway, Pa.

ELLIOTT Company



Ask your engineers and operating men..."Who builds the BEST POWERHOUSE MOTORS?"

The men in your company who are most thoroughly familiar with boiler-feed pump motors know how to recognize the design and construction features that contribute to long life and dependable trouble-free operation. Ask them if they recommend buying by the "market-basket" system . . . or from a specialist. Ask them "Who builds the *best* powerhouse motors?"

SPECIALISTS for 50 years

Elliott built the world's first large 2-pole motor in 1916. And over the years since then Elliott has specialized in large squirrel-cage induction motors which have established outstanding operating records.

PACEMAKERS in advanced designs

Elliott has consistently pioneered in new and advanced large motor designs—all "firsts" in the industry. And today, Elliott has either built or is building 39 of the largest 2-pole motors ever built . . . 11 motors, each 4500 hp . . . 24 motors, each 5000 hp . . . 4 motors, each 6000 hp.

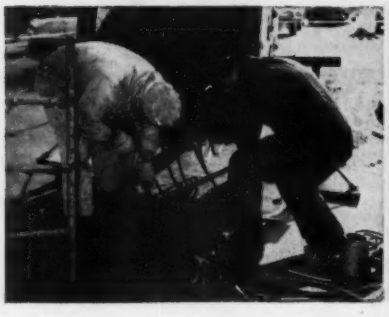
RB-2

Power Boost with **PARANITE®**

Consolidated Edison is meeting the challenge of mounting demands for electrical power with a systematic program of replacement and expansion. Selected to help carry this ever-increasing load in the Metropolitan New York area is Paranite "Network Power Cable" . . . one of the many Paranite products which backs up a reputation . . . "IF IT'S PARANITE IT'S RIGHT®"

Why PARANITE "NETWORK CABLE?"

Paranite Network Cables are engineered, manufactured, tested and have been proven in installation to meet the severe demands of seasonal peak loads. The consistent performance of Paranite marks it as a product of close quality control!



PARANITE WIRE AND CABLE DIVISION

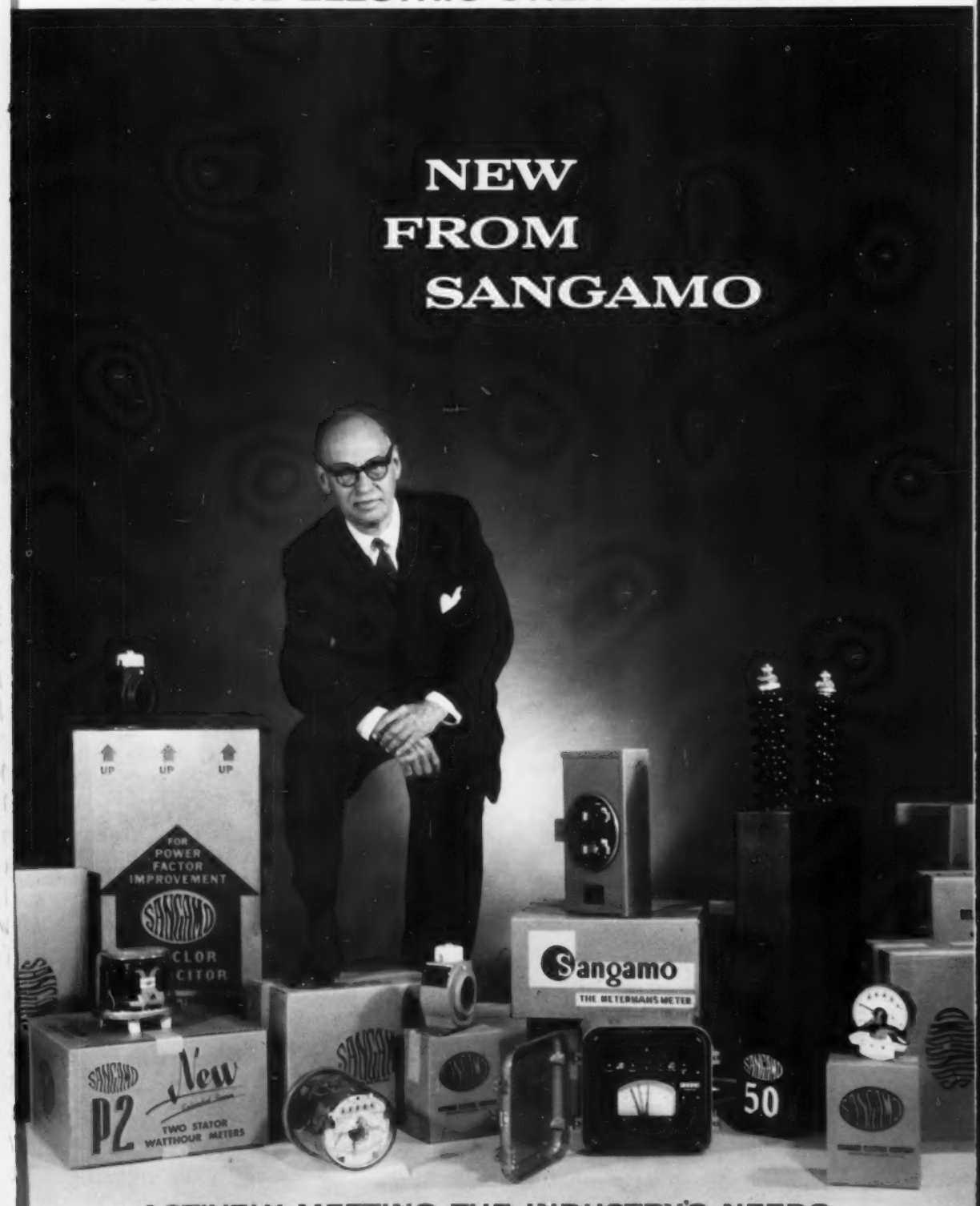
Essex Wire Corporation, Fort Wayne 6, Indiana

MANUFACTURING PLANTS: Birmingham, Ala.; Anaheim, Calif.; Jonesboro, Ind.; Marion, Ind.; Tiffin, Ohio

Sales Offices in all Principal Cities

Another year
of product
development

FOR THE ELECTRIC UTILITY INDUSTRY:



ACTIVELY MEETING THE INDUSTRY'S NEEDS...
for increasing the utilities saleable power
and for better methods of measurement

DEVELOPED TO MEET YOUR NEEDS:

New Demand Meters

FOR CONTINUED LEADERSHIP IN DEMAND METERING

THERMAL DEMAND The compact Type PWS watthour and Lincoln demand meter combines the new features of the two-stator polyphase meter and the Lincoln watt demand meter.

It's easy to read—easy to adjust. Simplified design makes components readily accessible.

Where future load growth is anticipated, capacity of the demand element can be doubled by changing two link connections and changing the demand scales (24/48 kw or 48/96 kw).

MECHANICAL DEMAND

Sangamo's new Type D mechanical demand register, when installed on any of the Sangamo Type P2 extended range watthour meters, accurately measures kw demand on all polyphase loads.

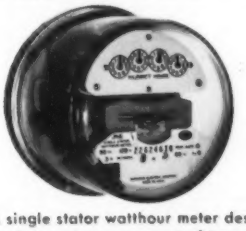
Universal and standard Type D registers were designed to give greater disk visibility, better service accuracy, time interval indication, and simple disengagement of timing motor for register checking.

New Multi-Stator Meters

FOR EXTENDED RANGE ON ALL POLYPHASE SERVICES

Sangamo has designed a complete line of Type P polyphase watthour meters to give greater versatility of application through extended range . . . easier adjustment and maintenance . . . high insulation level . . . savings in height and cover replacement . . . and proven economy through *slow speed*.

and new meters
DESIGNED FOR SPECIAL METERING PROBLEMS



A single stator watthour meter designed for low cost measurement of two phases of a four-wire, three phase system.

A kvar hour meter to measure reactive energy (and demand) without the use of external phase-shifting transformers.

A kva hour meter to measure apparent energy (and demand) without the use of external phase-shifting transformers.

THE NEWEST ADVANCES IN 600 V CLASS CURRENT TRANSFORMERS

200, 400, 600, 800 AMPERES WITH DUAL RANGE 200/400 AMP FEATURE

Sangamo Type BH (Big Hole) Transformers have more cable space, more installation room, easier cable insertion—and a unique two range option to reduce transformer changeouts.

COLOR CODED FOR QUICK IDENTIFICATION

Transformers are molded in an epoxy resin of standard resistor colors to indicate ampere ratings.

SANGAMO ELECTRIC COMPANY

SPRINGFIELD, ILLINOIS

DEVELOPED TO MEET YOUR NEEDS:

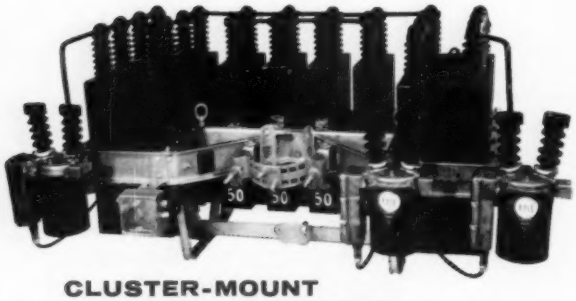
New capacitors, equip

TO INCREASE THE U

SECOVAR
SECONDARY CAPACITORS

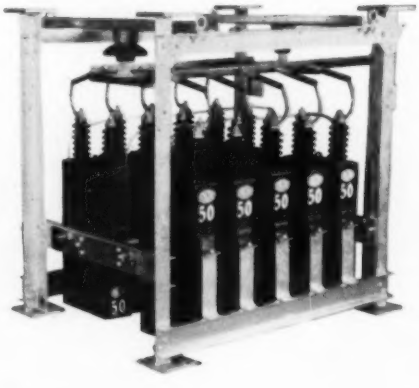
These 240 volt capacitors are an exclusive Sangamo development. Installed at the customer's service, Secovars give maximum system benefits all down the line, and give the advantages of low first cost—quick and easy installation off the pole.

Keenly aware of your problems of reducing the amount of wattless power and improving voltage on your system, Sangamo's developments this year make its line of capacitors and controls the most extensive in the industry . . . your first source of supply for all capacitor needs.



CLUSTER-MOUNT
AUTOVAR EQUIPMENTS

Sangamo engineered, pre-wired cluster-mount equipments give you a fast, easy, economical capacitor installation and better weight distribution on the pole.



OPEN-TYPE EQUIPMENTS

These cost-cutting singlephase or polyphase stacking units have been designed for combinations to give any desired kvar for all primary voltages.

LIVE BETTER ELECTRICALLY

SANGAMO ELECTRIC COMPANY

uipments, and controls

E UTILITIES SALEABLE POWER

15 KV CAPACITORS

These capacitors were developed for floating Y applications and are capable of resisting voltage surges up to 95 kv.

HOUSED CAPACITOR EQUIPMENTS

Combining safety and neat appearance, these housed equipments provide a compact installation with features including automatic control and circuit breakers.

SUBMERSIBLE SECONDARY EQUIPMENTS

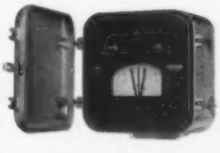
Developed for low voltage underground network installations, these factory-assembled equipments are completely submersible.

SUBMERSIBLE PRIMARY EQUIPMENTS

Sangamo designed these completely sealed primary equipments for underground installation in locations where overhead pole space is not available.

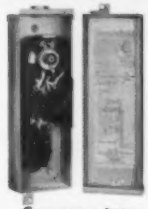
NEW CONTROL ADDITIONS TO THE MOST COMPLETE LINE IN THE INDUSTRY

Socket type voltage Lincolntrol

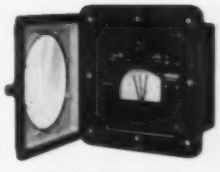


Voltage Lincolntrol with thermostat bias

Carryover socket type time switch



Carryover type time switch



Switchboard type Lincolntrol

To keep pace with your switching applications, Sangamo's new control developments, in addition to the above, are units for temperature control, current bias voltage control and sequence switching.

DEVELOPED TO MEET YOUR NEEDS:

New Lincoln Meters
FOR SYSTEM MEASUREMENT

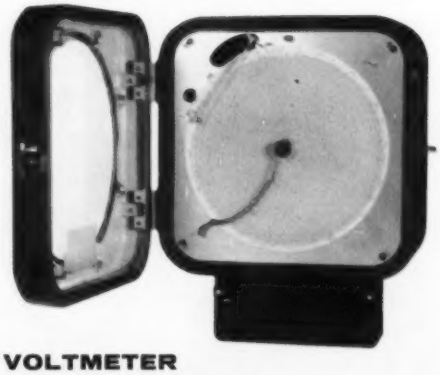
For simple low-cost network system load measurement

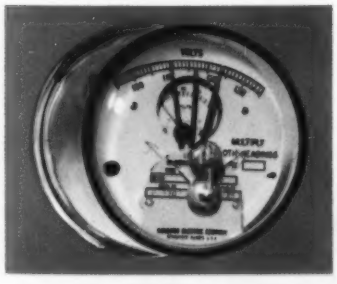
Developed for survey information on underground networks, new submersible split-core transformers and Lincoln graphic ammeter provide unusual flexibility.

Indicating ammeter can be permanently mounted outside vault using new split-core transformers located on network protector bushings.

SYNCHRONOUS-CARRYOVER GRAPHIC METER

Sangamo designed this graphic meter to keep the chart turning during power interruptions. The carryover-drive mechanism maintains timing for outages up to 14 hours and also provides a record of the number and time of outages.





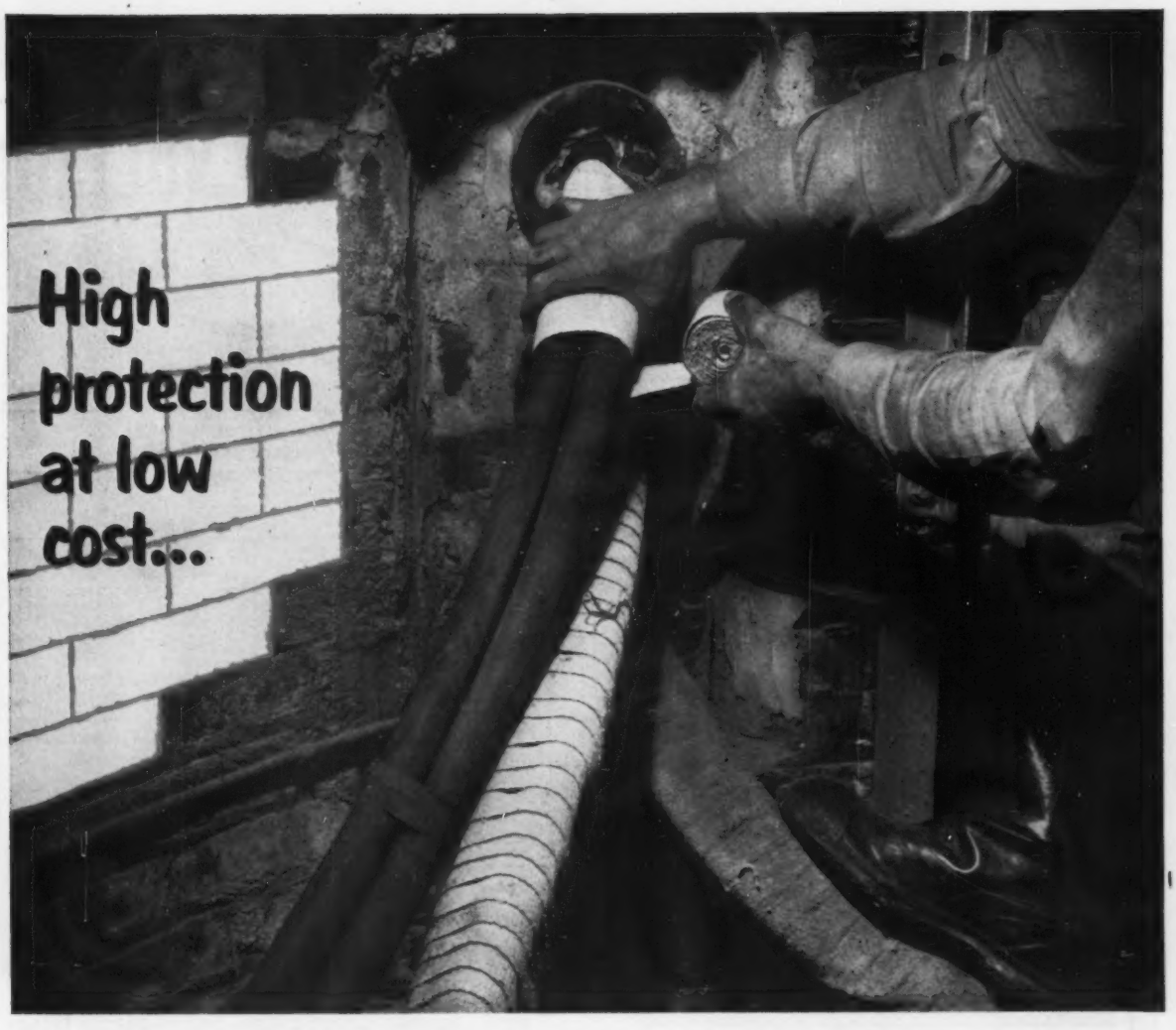
LINCOLN INDICATING VOLTMETER

A newly designed model of the Lincoln voltmeter gives "steady state" maximum and minimum voltages and instantaneous readings for immediate indication as to whether the circuit is energized.

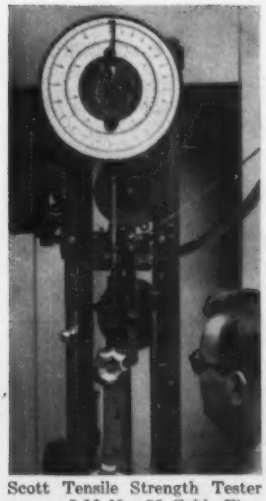
SM58-8

SANGAMO ELECTRIC COMPANY

SPRINGFIELD, ILLINOIS



J-M No. 55 Cable Fireproofing Tape helps contain blowouts—isolate trouble



Scott Tensile Strength Tester proves J-M No. 55 Cable Fireproofing Tape maintains its high strength even after burnout.

Reduce the danger of arc multiplying your troubles in the event of cable failure. Repeated tests prove Johns-Manville No. 55 Tape helps contain arc and splash . . . and retains substantial strength even after being burnt out!

Leading public utilities have chosen J-M No. 55 for its long-range economy plus its dependability. In addition to exceeding their protection requirements, it saves time and money because it costs less to apply. It goes on faster because it's applied *dry*, wraps easily even in confined spaces.

J-M No. 55 protects cables for years under manhole conditions because of top quality asbestos construction and thorough impregnation with silicone. Produced by J-M in an economical thickness, it is high in water repellence, low in water absorption . . . resistant to flame, heat, oil, fungus and mold . . . nonsagging . . . abrasive resistant. The selvaged edges keep ground water out . . . and threads cannot pull out.

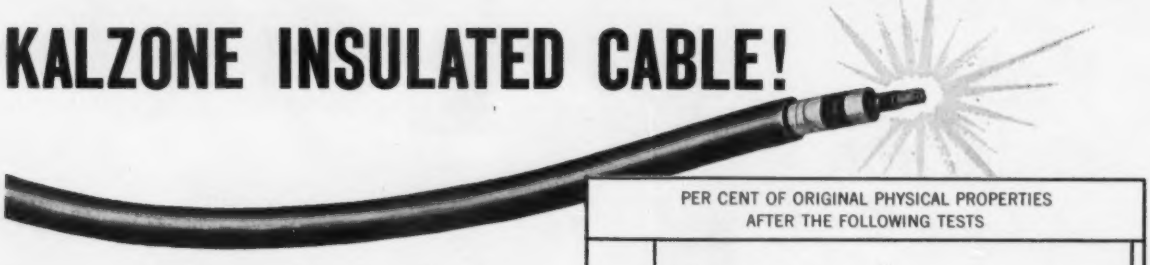
For complete details, and test data on J-M No. 55 Cable Fireproofing Tape, write for new brochure TX-6A. Address, Johns-Manville, Box 14, New York 16, N. Y. In Canada: Port Credit, Ontario.

JOHNS-MANVILLE

100 YEARS OF QUALITY PRODUCTS...1858-1958

JOHNS-MANVILLE JM PRODUCTS

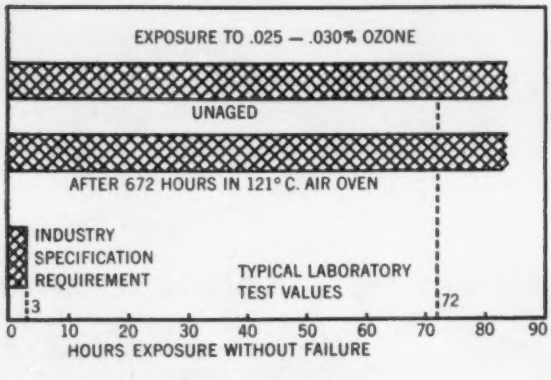
10 TIMES MORE INSULATION RESISTANCE WITH KAISER ALUMINUM HIGH VOLTAGE KALZONE INSULATED CABLE!



A year-long analysis of 393 full-length reels of Kaiser Aluminum Kalzone insulated cable showed that more than 93% of the lengths tested exceeded an insulation resistance constant "K" of 100,000 . . . ten times greater than current IPCEA requirements of 10,000!

More than 5% of the balance tested exceeded a 50,000 "K," and ¾ of 1% fell between 25,000 and 50,000.

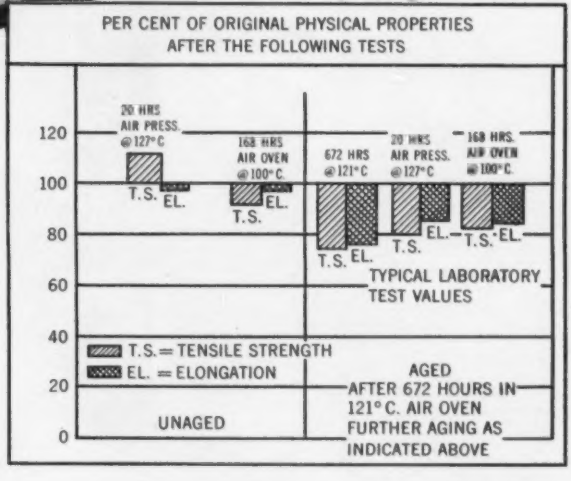
Laboratory tests prove Kalzone provides best protection against ozone, heat, moisture


EXPOSURE TO .025 — .030% OZONE
UNAGED
AFTER 672 HOURS IN 121° C. AIR OVEN
INDUSTRY SPECIFICATION REQUIREMENT
3
TYPICAL LABORATORY TEST VALUES
72
0 10 20 30 40 50 60 70 80 90
HOURS EXPOSURE WITHOUT FAILURE

OZONE RESISTANCE

Unaged—Withstands more than 72 hours in .025–.030% ozone without failure.

Aged—Still withstands more than 72 hours in .025–.030% ozone without failure after 672 hours in a 121°C. Air Oven.



HEAT RESISTANCE

Unaged—Practically unaffected by Air Pressure or Air Oven Tests.

Aged—Actually improves in per cent of original tensile strength and elongation in Air Pressure and Air Oven Tests, after 672 hours in 121°C. Air Oven.

MOISTURE RESISTANCE

MECHANICAL

Unaged—Less than 5 milligrams absorption in standard Gravimetric 7-day Test. (IPCEA, 15 mgms.)

Aged—After 672 hours in a 121° C. Air Oven, less than 7 milligrams absorption.

ELECTRICAL

Unaged—Less than 2% increase in Capacity in 1–14 day EM-60 Test. (IPCEA, 5%.)

Aged—After 672 hours in a 121°C. Air Oven, less than ½ of 1% increase in capacity in 1–14 day EM-60 Test.

Kaiser Aluminum Kalzone insulated high voltage cable is laboratory tested and quality controlled during actual production to assure *proved quality* with every reel. Get full details on this low cost, lightweight aluminum power cable now. Contact the Kaiser Aluminum sales office listed in your telephone directory.

Kaiser Aluminum & Chemical Sales, Inc., 919 N. Michigan Avenue, Chicago 11, Illinois.

KAISER ALUMINUM

IF IT CARRIES CURRENT, K/A CARRIES IT!

MECHANIZED ORACLE EXPLORES BELL SYSTEM COMMUNICATIONS

At monitoring console, designer H. D. Irvin watches performance of "Sibyl" during test of user-reaction to experimental telephones. A computer-like machine, Sibyl simulates the functions of future communications devices and records interplay between phones and users. Sibyl is named after the women oracles of ancient Greece.

A mechanized "oracle" is helping Bell Telephone Laboratories predict the future in communications devices and systems.

The oracle is "Sibyl," a computer-like machine developed by Bell Laboratories engineers and psychologists. It can simulate the action of many kinds of communications devices. Through Sibyl, new kinds of telephone service can be evaluated without the considerable expense of building actual equipment. Observing and recording users' reactions to the simulated equipment, Sibyl provides indications of how users would react to proposed new systems features and equipment.

Sibyl, for example, is used to test the reaction of Bell Laboratories people to experimental push-button telephones. Each test subject has a push-button telephone in his office and he uses it in the ordinary course of his business. But the set is not connected directly to the local PBX: it is connected *through* Sibyl, which performs the special signaling functions required by such a push-button telephone. In this way, push-button telephone service is given to a group of people without modifying the PBX, or providing completely instrumented push-button telephones.

At the same time, Sibyl gathers information on how the call was placed—date, time, originator, speed of operation, errors, whether the line was busy or the call completed. Sibyl does all this without violating the privacy of telephone conversations.

Bell engineers expect that Sibyl will provide a better understanding of the relationship between telephone equipment and the people who use it. Sibyl's rapid and economical technique for evaluating new types of telephone sets is an important contribution to the art of telephony.

BELL TELEPHONE LABORATORIES
WORLD CENTER OF COMMUNICATIONS RESEARCH AND DEVELOPMENT

CSP integral primary unit substations . . .
coordinated, assembled and tested by Westinghouse . . .

SINGLE ENGINEERING PURCHASING . . . SINGLE-RELOCATION WHEN

RESPONSIBILITY SIMPLIFIES
UNIT FLEXIBILITY PERMITS
LOADS SHIFT

Completely self-protecting and self-contained, the Westinghouse CSP® unit substation is ready to install. No special engineering is necessary; Westinghouse has already coordinated, assembled and tested all component parts . . . Here is a complete package that streamlines and simplifies your purchasing — with undivided responsibility for meeting your every requirement.

These units offer excellent economical advantages for loads of moderate to high load density, particularly where the load is expected to shift in the future. Installation is rapid and economical, the single unit requiring but a single pad; no interconnection and coordination of components.

Single-unit flexibility eases relocation problems, too. The complete substation can be disconnected, moved to the new site and reconnected.

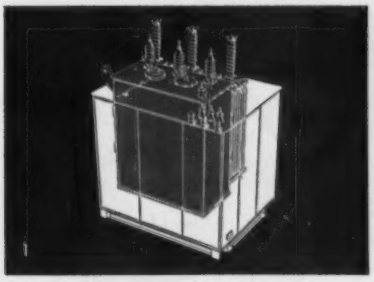
A contoured unit is available for residential areas; with all equipment enclosed in a steel cabinet, high- and low-voltage leads enter through the bottom, and overhead structures are eliminated.

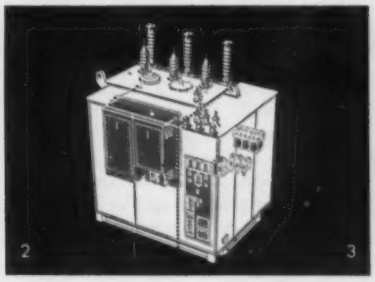
The Westinghouse CSP unit substation is a prime example of how PLOWBACK OF EARNINGS into vast engineering facilities is helping to solve your everyday electrical distribution problems — now, and for the future. For the complete story of its advantages, call your Westinghouse representative; or write Westinghouse Electric Corporation, P.O. Box 868, Pittsburgh 30, Pa.

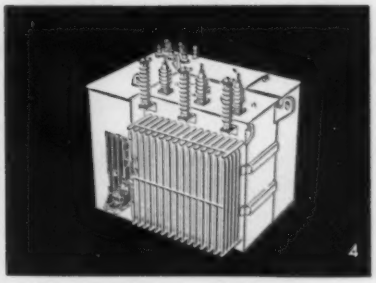
J-70878

YOU CAN BE SURE...IF IT'S

Westinghouse







CSP unit consists of (1) completely sealed coreform transformer — all gauges, valves and protective devices contained within the substation housing; (2) load tap changer — accurate, automatic voltage regulation; (3) metering instruments and controls; and (4) De-ion® circuit breaker, which fully protects against circuit and overload damage.

Mr. Terry W. States, Westinghouse representative, explains the flexibility advantage of the contoured Westinghouse CSP unit substation.

NEW!

ROME *TRIMLINE**

*T.M. (patent applied for)

PRIMARY DISTRIBUTION SYSTEM

WITH A NEW SIMPLIFIED SPACER DESIGN!

A Practical Overhead System. Developed for utility and industrial distribution circuits ranging from 5 to 15 kv, Rome's TRIMLINE system consists of (1) a unique and highly simplified Plexiglas® supporting spacer, (2) extruded high molecular weight polyethylene insulated phase conductors (either one, two, or three phase), and (3) a high strength supporting messenger.

This economical method of overhead distribution is recommended for installations where:

- additional circuits are required on a pole
- poles are too crowded for additional crossarms
- bad tree and storm conditions cause havoc with open-wire lines
- alleyways prohibit use of crossarms

. . . and especially where a *compact* and *neat-appearing* distribution system is necessary!

System Features New Spacer. Now . . . a new spacer design makes Rome's TRIMLINE system as reliable as it is practical. The one-piece Plexiglas® spacer offers distinct "reliability" features. It has no mating or matching surfaces to form cracks or crevices which collect water or other contaminants. This in turn reduces the possibility of eventual arcing or shorting.

Each spacer is equipped with four "snap-lok" neoprene grommets (adapters). Special molded-in compression rings in each grommet assure a snug spacer-to-cable fit. The constant pressure exerted upon the messenger and conductors restricts the spacer from "traveling" on the line.

The spacer itself is shaped like a diamond with rounded corners and smooth edges. When installed, each of the phase conductors and the messenger are completely contained within the encompassing spacer unit.

Installation of the spacer unit is performed with no tools or special equipment, requires *no* nuts or bolts. And maintenance is just as easy—phase conductors can be removed or added without removing the spacer from the messenger. Spacers are placed approximately thirty feet apart along the entire length of the distribution system.

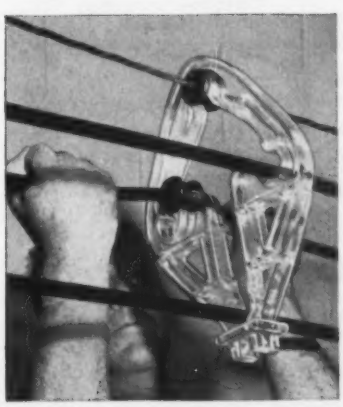
®ROHM & HAAS REGISTERED TRADE MARK

HERE'S WHAT THE TRIMLINE SYSTEM OFFERS YOU:

1. A *single* spacer for 5 to 15 kv range.
2. Abrasion-resistant high molecular weight polyethylene insulation or other suitable materials as specified by the user.
3. Neoprene grommets with molded-in compression rings.
4. A spacer that completely encloses phase conductors and messenger.
5. A high strength supporting messenger that provides storm damage protection.
6. Longer spans—the system messenger permits spans up to 300 feet.
7. Positive phase identification by position in spacer.
8. Lower reactance than conventional open-wire lines.
9. Ease of installation.
10. Neat, compact overhead distribution. Better public relations.

Send in the coupon for our new bulletin on Rome TRIMLINE Primary Distribution System.

SEND FOR FREE BULLETIN!



ROME CABLE

CORPORATION

Dept. T, Rome, N. Y.

I want more information on the Rome TRIMLINE Primary Distribution System. Rush me my free copy of Bulletin RCP-790.

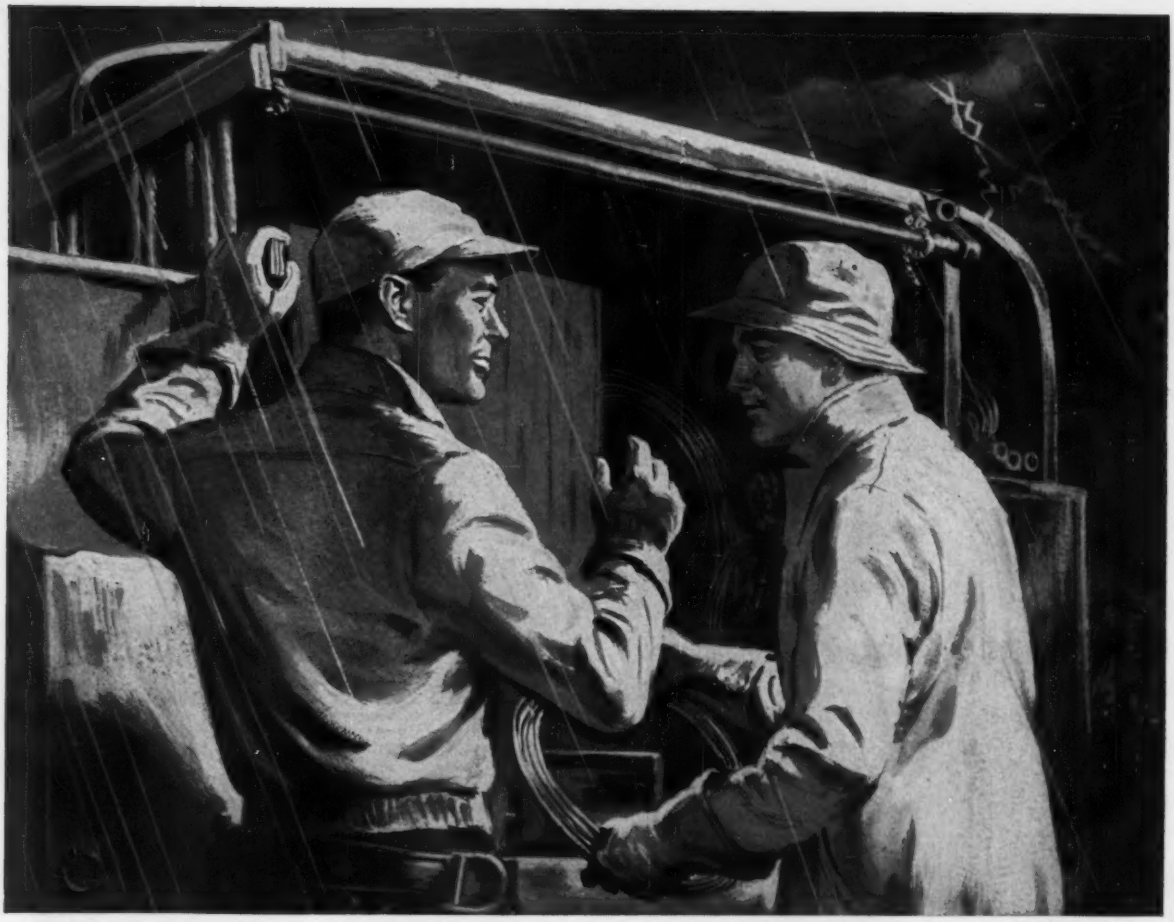
Name .....

Title .....

Company .....

Street .....

City ..... *State* .....



DON'T GET ME WRONG...I STILL DON'T LIKE STORMS

**"But they don't seem to hit us so hard any more.
Not since polyethylene coated wire came along."**

The lineman's boss also gives polyethylene credit for reducing outages during storms. This tough plastic forms a continuous shield that resists moisture, weathering and aging. It protects the conductor from contact with wind-whipped branches and wires, prevents short circuiting by chance electrical contacts.

Protection is long-lasting. Early installations have shown no deterioration after 11 years exposure to all sorts of weather. And accelerated aging tests point to an expected life as great as 40 years.

In winter, polyethylene coated wire stands up better than other types because it is lighter, has a smaller diameter. It offers less resistance to wind and ice . . . supports a greater weight of ice without breaking.

Easier Installation, too . . .

Polyethylene is easy to handle because it's clean . . . self-lubricating . . . readily stripped. Yet it adheres well, doesn't ruffle when pulled.

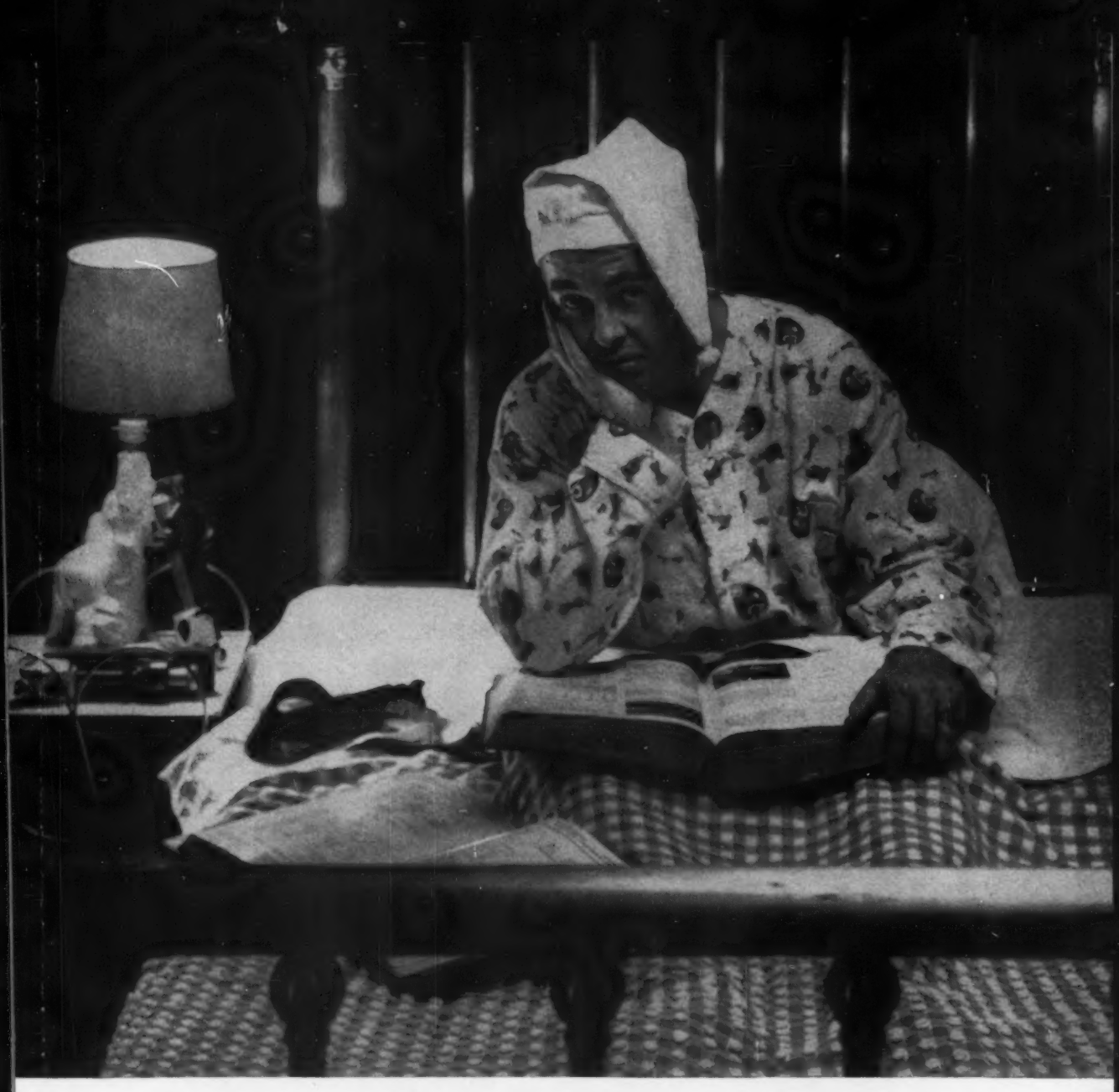
Here are some of the applications where polyethylene is giving outstanding service:

- Line wire covering
- Communication cable insulation and sheaths
- Power cable dielectric
- Tree wire covering
- GTO (Neon Sign) Cable
- WD-1 Infantry Field Wire
- Control cable insulation and jacket
- Corrosion protection for metal sheaths
- TV Lead Wire

But all polyethylenes aren't the same. Ask your supplier about the superior weather and stress-crack resistance of coatings made with PETROTHENE® polyethylene resins. You pay no more for PETROTHENE quality.

U.S.I. INDUSTRIAL CHEMICALS CO.
Division of National Distillers and Chemical Corp.
99 Park Ave., New York 16, N. Y.
Branches in principal cities

Makers of PETROTHENE® Polyethylene Resins



Shopping for hardware . . . or protection?

Lots of utility men have come to accept the old reliable fuse cutout as so commonplace that it can be bought from a catalog like a piece of hardware . . . considering all makes equal in performance.

You'd never dream of short-changing yourself when it comes to protecting your generators or large transformers. Why not the same regard for *distribution* protection?

It will pay you to investigate the real difference in fuse cutout values. Development testing at Westinghouse's High Power Laboratory guarantees that extra value in Westinghouse fuse cutouts. J-60949-1

See how Westinghouse makes "protection buying" A Sure Thing (*turn page*)

HERE'S A MODERN "TORTURE RACK"

A truly universal cutout...type EU

Exhaustive testing at the Westinghouse laboratories proves the ability of their new universal EU cutouts. The stop-motion photos above show one stage of testing the EU cutout . . . satisfactorily interrupting an 8000-amp fault. Controlled current interruptions with maximum asymmetry insure capacity to handle over and over the most severe faults which will occur on your system.

But interrupting tests are not enough. Before a new design is ready for sale, temperature rise, radio influence, impulse tests, wet and dry withstand tests, vibration and shock tests must be completed. They are your assurance that you are getting the best protection your dollar can buy.

Ask your Westinghouse sales engineer today for complete test specifications and a demonstration of this cutout in your own office . . . or, for complete information, write Westinghouse Electric Corporation, P.O. Box 868, Pittsburgh 30, Pa.

WESTINGHOUSE HIGH POWER LAB

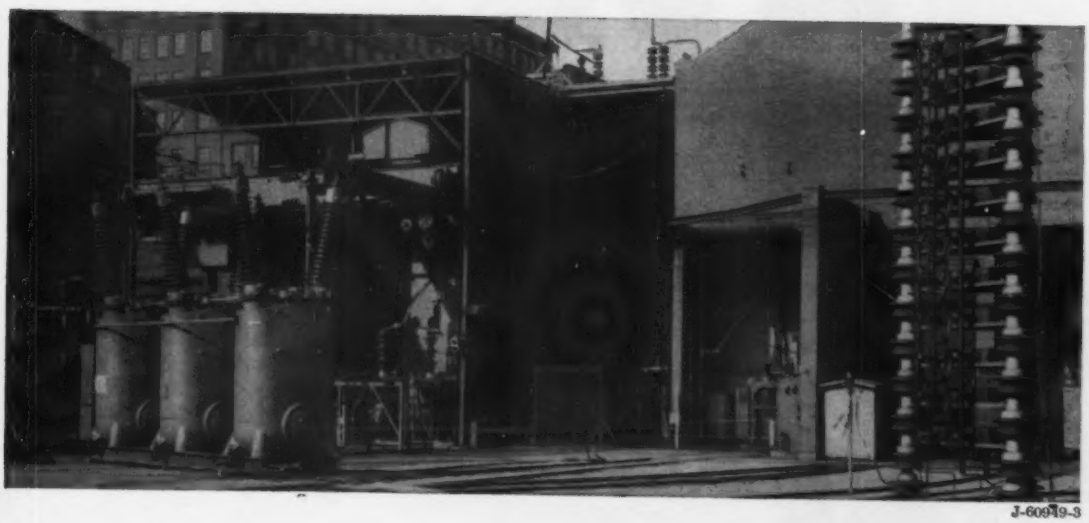
Anyone with a transformer, a circuit breaker and a cutout can carry out interrupting tests, but it's a different story for *fundamental* research! Investigation of tube rocket action, erosion and current clearing ability is a time-consuming process requiring years of engineering experience and extensive test facilities found at the Westinghouse High Power Lab.

J-60949-2

YOU CAN BE SURE...IF IT'S **Westinghouse**

WATCH "WESTINGHOUSE LUCILLE BALL-DESI ARNAZ SHOWS" CBS TV MONDAYS

THAT DEVELOPS BETTER CUTOUTS



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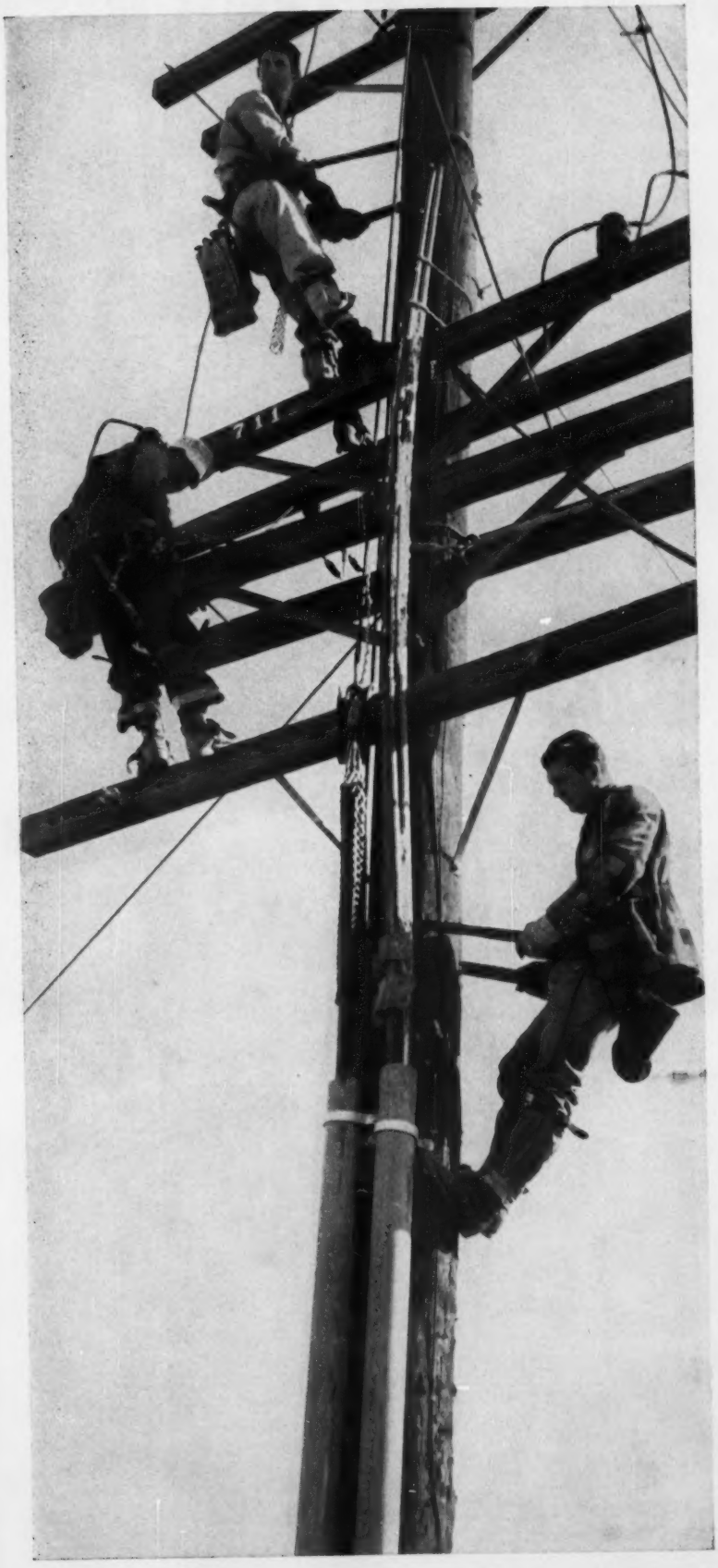


Neoprene

Houston Lighting

protects lead from electrolysis in & Power Company system

Electrolytic attack of the lead sheath on underground cable was once a problem for Houston Lighting & Power Company. Deterioration was severe in Galveston, where much of the underground cable lies in brackish water in sea-level manholes and runs. Even in the city of Houston, somewhat higher elevation and distance from salt water did not save lead-sheathed cable from damage.

Protective neoprene jackets hold promise of ending this problem. Many of the underground installations in the Houston Lighting & Power Company system are now jacketed with neoprene, and there have been no maintenance problems with it. The covering on all triplex service drops is also neoprene.

Neoprene's durability and its ability to save time and costs have gained wide acceptance among Distribution Engineers. No other jacketing material so effectively resists ozone, sunlight and weathering, oils and chemicals, heat, flex cracking, abrasion and cutting, oxidation and aging.

Ask your supplier about wire and cable jacketed with neoprene. And mail the coupon for copies of the ELASTOMERS NOTEBOOK with on-the-job reports of neoprene's performance in a wide range of jobs.

DU PONT
REG. U.S. PAT. OFF.

Better things for better living
. . . *through chemistry*

NEOPRENE
— made by Du Pont
for 26 years

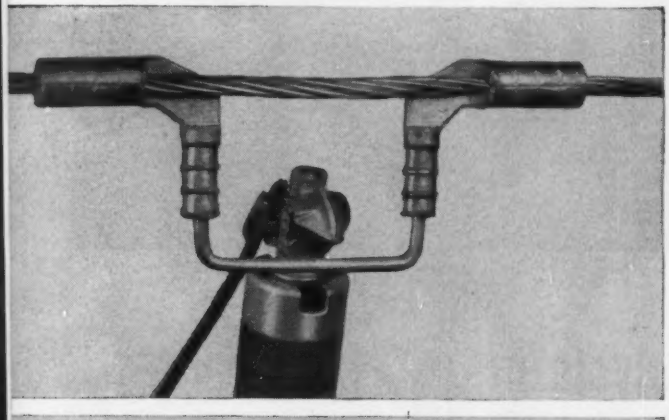
E. I. du Pont de Nemours
& Co. (Inc.)
Elastomer Chemicals Dept. EW-12
Wilmington 98, Delaware

Please put my name on the free mailing list for the ELASTOMERS NOTEBOOK.

Name_____
Position_____
Firm_____
Address_____
City_____ State_____

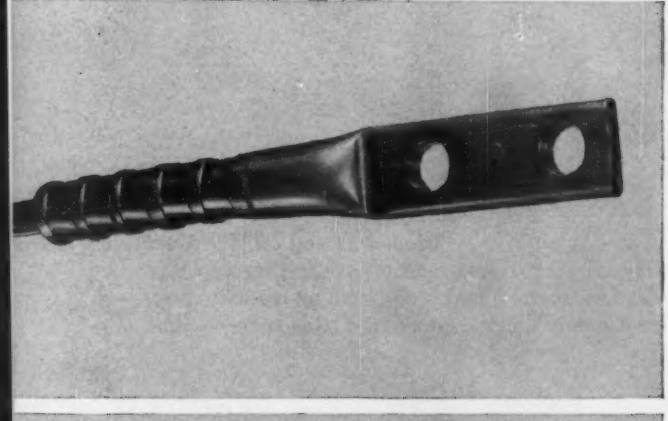
Kearney's compression program

Added versatility and increased application with existing tools—that's what an investment in Kearney Compression can mean for your system. Besides the basic connections—Squeezons, Serv-En Service Entrance Sleeves, Tension Sleeves and others—you receive the advantages of ever widening tool flexibility as Kearney Engineers continue to develop and introduce new Compression Fittings to the field.



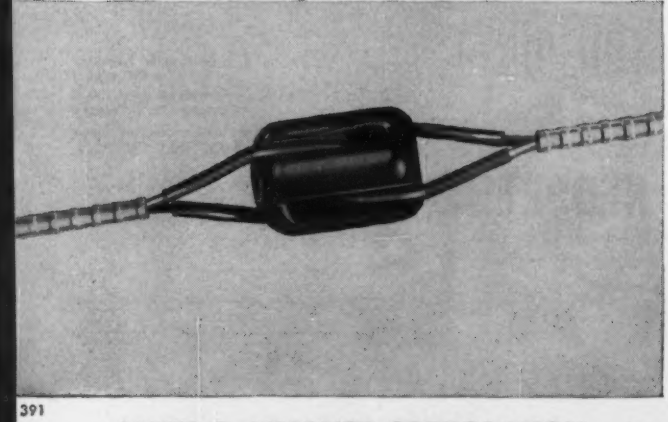
KEARNEY L Squeezon Stirrup

Line side connections are outside the basket—sufficient clearance for either the hydraulic or mechanical tool. The three inch dimension between the line and stirrup makes the unit neat and compact—hot line clamps are readily installed. Unit may be completely covered with line guards.



KEARNEY Compression Terminal

Kearney Compression Terminals provide an efficient method of connecting aluminum conductors to terminal pads. Flaring of strands possible with conventional terminal pads is eliminated. The strands are retained in an aluminum sleeve. Terminals have NEMA 1¾" bolt centers. May also be used as disconnectable jumpers around double dead-ends. The sleeves are filled with Kearnalex Contact Aid and capped and will take conductor sizes from 1/0 to 397.5 MCM 18/1 ACSR.



KEARNEY Insulated Splice

The Insulated Splice was designed primarily for splitting secondaries into shorter sections where additional transformers have been installed and for series street lighting applications. No changes in existing construction are required. Designed for copper, aluminum and ACSR connections, this splice features one piece construction, tension-type sleeves, insulated stainless steel bails and a high strength strain insulator. Splice can be installed with Kearney Hydraulic or Mechanical Tools. ACSR and aluminum sleeves are packed with Kearnalex Contact Aid and plastic capped.

JAMES R. KEARNEY CORPORATION • General Offices: 4224-42 Clayton Ave., St. Louis 10, Mo.

pays extra dividends

KEARNEY INSIDE TAPERED COPPER SLEEVE

A completely new, cost-cutting design—another Kearney "dividend"—permanent, positive, full tension splicing of energized conductors with standard Kearney tools and dies.

ADVANTAGES—

1. **Metallizing process**—copper sleeve is sprayed internally with conductive metal to assure maximum holding power and high conductivity.
2. **Full Inside Taper**—design assures ease of insertion of hot conductors—also relieves stress, due to vibration, at the extremities of the sleeve.
3. **Shorter Length** means less installation time, fewer crimps and no sacrifice of holding power—sleeve is more easily stored.
4. **Clearly marked** with conductor and die sizes.

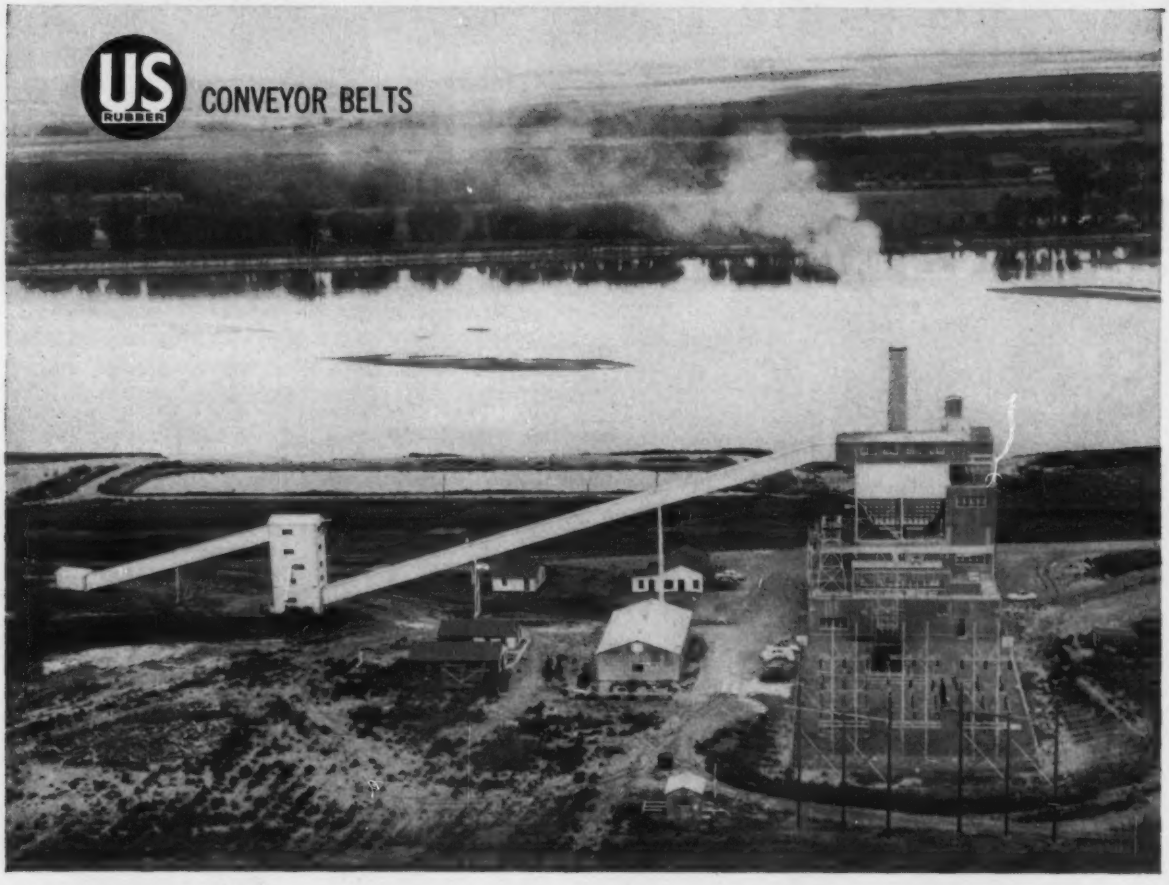
KEARNEY WH-1 TOOL

A rugged, reliable hydraulic tool which expedites the installation of Kearney compression fittings and sleeves. Hi-speed, two-valve pump permits fewer strokes for full compression—exerts 21,000 pounds thrust. The narrow "C" head permits full visibility of the working area. Balanced weight enables the lineman to position the tool quickly and accurately for each indent. Interchangeable, insulated wood handles with extra length are available for working higher voltages.

FOR BETTER CONSTRUCTION—SAFER MAINTENANCE

Specify Kearney Products

PLANTS AT: ST. LOUIS • FAYETTEVILLE, ARKANSAS • SHENANDOAH & CLARINDA, IOWA • GUELPH, ONTARIO, CANADA



550 tons a day over a long haul—

with many years of life ahead

Montana-Dakota Utilities Co.'s R. M. Heskett Electric Generating Station at Mandan, North Dakota, designed and constructed by Ebasco Services, Incorporated, consumes up to 550 tons of lignite per day in the peak months.

This operation is tight and efficient. It was bound to be, for engineers from "U.S.", from Ebasco, from the mechanical equipment maker, and from the utility company worked as a team to insure the RIGHT belts for the job. This example of "U. S." Coordinated Engineering, originally installed to feed one generating unit, can also serve future units #2, #3 and #4 when added capacity is needed, by merely speeding up the belts, WITHOUT additional investment in the conveyor system. Four belts are used:

Two (twin) track hopper belts, each 56 feet in length. These are U. S. Giant®, 36", 4-ply, highly resistant to tearing, gouging, and abrasion. Nyton® breaker strip for highest resistance to impact. These belts receive the lignite from the railroad track hopper and discharge it onto—

One U.S. Giant 36", 4-ply XN, 790 feet in length, which delivers the lignite from the track hopper, over a weightometer, to the crusher house.

One U. S. Giant 36", 4-ply XN, 650 feet long, from the crusher house to the tripper in the lignite gallery.

Placed in operation in December, 1954, the belts have presented no maintenance problems, show no signs of wear.

Thousands of conveyor belt installations, big and small, (from the world's largest maker) attest to "U. S." Coordinated Engineering – in every industry, in every kind of materials-handling problem.

• • •

When you think of rubber, think of your "U. S." Distributor. He's your best on-the-spot source of technical aid, quick delivery and quality industrial rubber products.

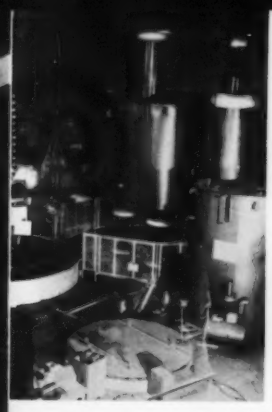
US RUBBER

Mechanical Goods Division

United States Rubber

WORLD'S LARGEST MANUFACTURER OF INDUSTRIAL RUBBER PRODUCTS

Rockefeller Center, New York 20, N.Y. In Canada: Dominion Rubber Company, Ltd.



Westinghouse High Voltage Laboratory at Trafford, Pa., where test voltages range to 1,000,000 volts, continuous 60 cycle, and to 3,000,000 volts surge.

3 million volts subject apparatus to nature's roughest test

PLOWBACK OF EARNINGS CREATES HIGH VOLTAGE LABORATORY

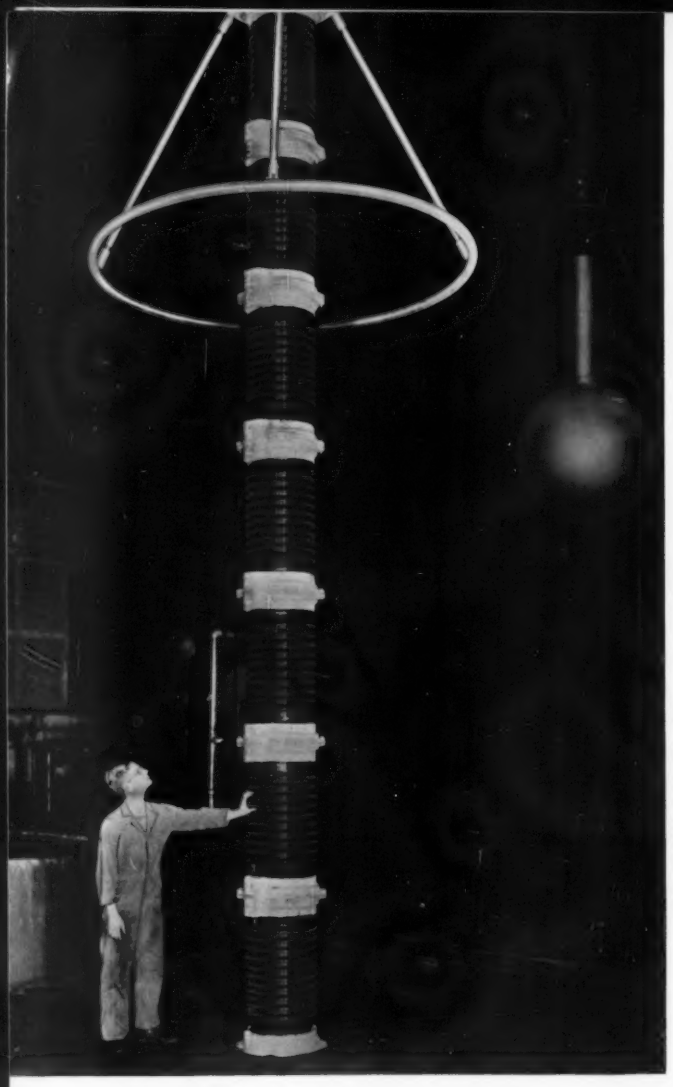
At the Westinghouse Trafford, Pa. plant, the most complete high voltage testing facilities in the industry are constantly at work proving and improving apparatus for the electric utility industry. Here, specially designed equipment reproduces the tremendous surges of natural lightning—impossible in conventional high power laboratories and research facilities. On the left, for instance, is shown a 350-kv experimental arrester . . . exhaustive testing of this unit led to development of the modern Westinghouse SVS self-supporting, folded-pole arrester pictured on the reverse side of this page.

Insulation strength of all types of equipment is predetermined at the laboratory and steps are taken to prevent failure in actual use. Hence, all Westinghouse apparatus is thoroughly proved at design stage. These facilities are used also to investigate corona and corona loss, radio and television influence, effects of weathering, and produce a host of technological advances.

Through such reinvestment of earnings into research, Westinghouse is providing the electric utility industry with equipment of the highest material and functional quality —equipment which assures safe, economical, lasting service and satisfied customers.

YOU CAN BE SURE...IF IT'S

Westinghouse



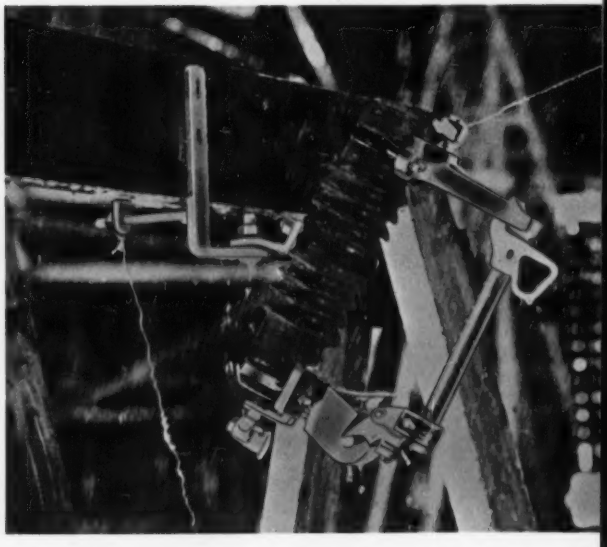
Man-made lightning bolts prove effectiveness of "condensed" arrester design

Westinghouse research and testing methods have put station protection years ahead of requirements. The problems of decreasing space allowances and greatly expanded operations have made it necessary to pack more protection into smaller areas. Westinghouse has reduced arrester height as much as 45% by physically paralleling the elements while keeping them in series electrically. The arresters are self-supporting and have up to 300,000 pound/inch cantilever strength.

These developments and facilities are but a part of many which are continuously at work, finding better ways to make better equipment economically for the electric utility industry. For information, call your Westinghouse representative, or write Westinghouse Electric Corporation, P.O. Box 868, Pittsburgh 30, Pennsylvania.

Exhaustive testing guarantees maximum protection for costly equipment

Tests like this voltage-withstand trial, using a 30,000-volt circuit under conditions simulating heavy rain, subject cutout insulation to the severest service stresses. With such thorough testing, Westinghouse protective devices assure you of the greatest possible protection from flashover at contacts or sheds. JI-97232-2



YOU CAN BE SURE... IF IT'S Westinghouse

News about

B.F.Goodrich Chemical *raw materials*

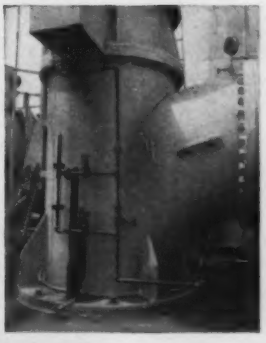
AT FLORIDA POWER & LIGHT'S CUTLER GENERATING STATION

How pipe of Geon helps cut maintenance

The large photo shows 3½" pipe made from Geon rigid vinyl material that is used to feed an aqueous solution of chlorine into sea water just ahead of bar screens at the intake structure. The chlorine prevents buildup of algae in condenser tubes and in the circulating water system.

The smaller photo shows more pipe of Geon circulating salt water to cool the bearings of circulating water pumps. Geon is not affected either by salt water or most chemicals—which proves its value in still another part of this large generating station.

Geon is used to pipe the acid bearing (H_2SO_4) wash-down water from the boiler waste hopper to the discharge canal. Geon piping is used also for pumping salt water to the soot disposal collectors.



Geon pipe and conduit also provide high impact and tensile strength. Both are lightweight, easy to install. They are examples of the way that versatile Geon provides the key to new and improved products or applications. For information, write Dept. LR-13, B.F. Goodrich Chemical Company, 3135 Euclid Avenue, Cleveland 15, Ohio. Cable address: Goodchemco. In Canada: Kitchener, Ontario.

B.F.Goodrich Chemical Company
a division of The B.F.Goodrich Company

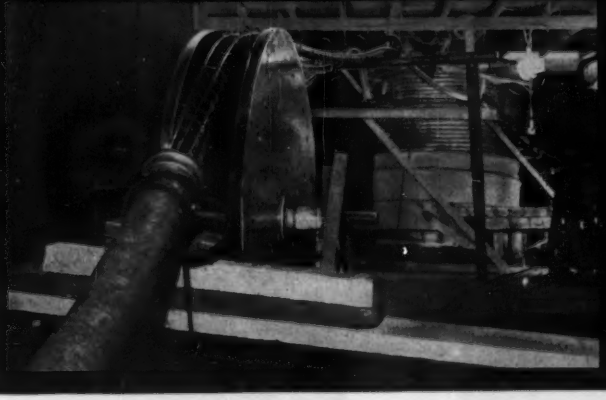
B.F.Goodrich

GEON polyvinyl materials • HYCAR American rubber and latex
GOOD-RITE chemicals and plasticizers • HARMON colors

Phelps Dodge

WIDEST RANGE OF HIGH

Pipe Type, Compression Cable, from 15 KV to 230 KV.

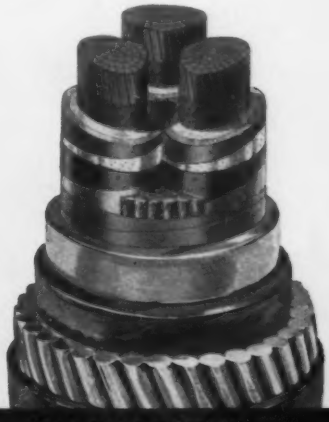


Low Pressure, Oil-Filled Cable, from 15 KV to 230 KV.

Consult Phelps Dodge for the correct answer to your requirements, regardless of voltage or type!

offers Industry's VOLTAGE POWER CABLE!

Only Phelps Dodge has manufacturing experience and operational "know how" with the entire range of high voltage cables which includes: oil compression, gas compression, high pressure oil, high pressure gas, pipe type cables; medium pressure gas, low pressure oil-filled, low pressure gas, submarine and solid type cables.



Low Pressure, Gas-Filled Cable, from 15 KV to 44 KV.

Submarine Cable, from 15* KV to 35 KV.

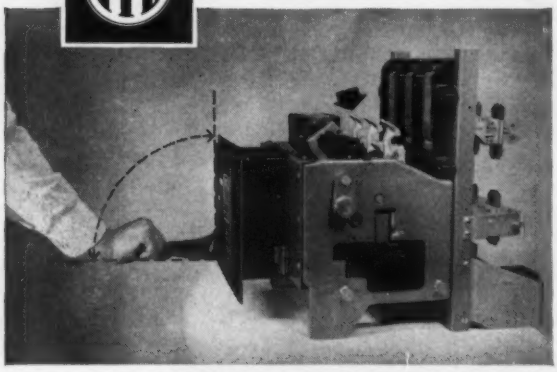
Solid Type Cable, from 15* KV to 69 KV.

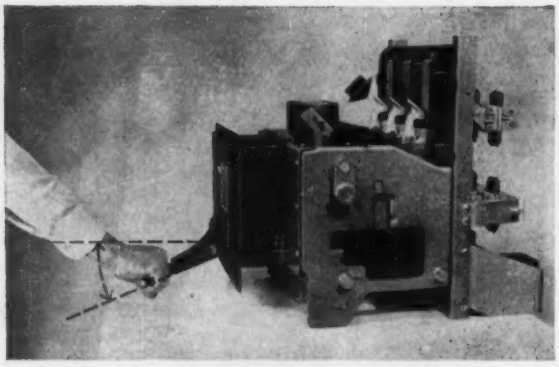
*Lower voltage cables in this class also available.

PHELPS DODGE COPPER PRODUCTS CORPORATION

300 PARK AVENUE, NEW YORK 22, N. Y.

K-LINE LOW VOLTAGE SWITCHGEAR

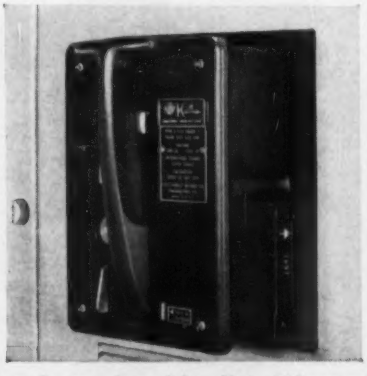


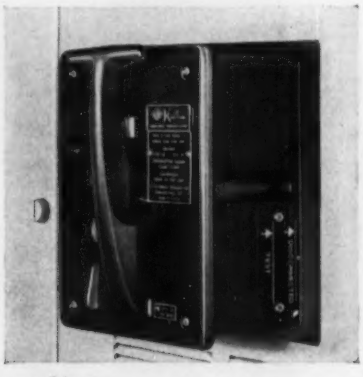


Only I-T-E has manual quick-make operation available in 225 through 1600 amp rating

Only handle moves. Contacts are static during first 90% of pulldown handle travel. In this picture, arc chutes are removed.

Too fast for the eye. When stored energy mechanism passes crossover point, energy is released to close contacts within 5 cycles.





Only I-T-E has doors closed in all positions while racking

With breaker connected. Both power and control separable contacts are engaged.

In test position. Power contacts disconnected —control contacts connected.

Completely disconnected. Both power and control contacts fully disconnected.

Quick-make, manually charged closing feature and drawout with doors closed provide maximum safety for operator and circuit breaker

You can't tease and burn the contacts of the new quick-make K-Line of circuit breakers—the closing action is fast and positive. An ingenious stored energy mechanism does the job. It stores energy in the first 90% of the pulldown handle travel, releases it in the last 10%. Not until the crossover point is reached do the contacts move. And it closes in only 5 cycles—provides uniform closure every time. *More important, it is the only manually charged stored energy circuit breaker available that will close and latch against its short-time rating.* This means greater safety for the operator, less maintenance, and longer contact life.

You don't have to open the door to move the circuit breaker to test or disconnected position. The crank which operates the simple drawout mechanism fits into the escutcheon through a lift shutter. The shutter cannot be lifted while the breaker is closed. The breaker cannot be closed while the shutter is lifted. This means more than greater safety—you can forget the dirt problem; the nuisance of open doors impeding aisle travel; the risk of circuit breaker damage from exposure, even when completely out of service.

Bulletin 6004-C gives complete information about the new and safer I-T-E K-Line of low voltage switchgear. Contact your nearest I-T-E sales office for a copy. Or write Switchgear Division, I-T-E Circuit Breaker Company, 19th & Hamilton Sts., Philadelphia 30, Pa. In Canada: Eastern Power Devices Ltd., Port Credit, Ont.

I-T-E CIRCUIT BREAKER COMPANY
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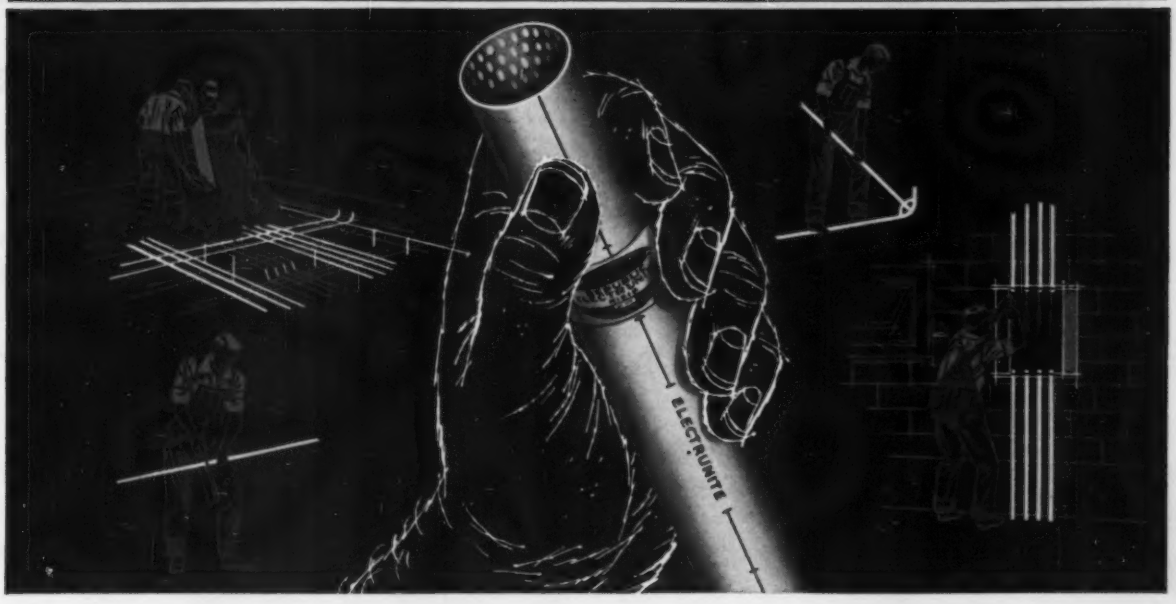

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ELECTRUNITE sets the pace for installing tomorrow's load-building capacities economically. More power today to produce more goods, services, and conveniences tomorrow requires built-in electrical conduit capacity to meet ever-increasing demands.

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Investigate these money saving advantages that may be applied to the purchase of additional load-building equipment and conveniences. Then you will see why it's good business for utilities to recommend Republic ELECTRUNITE E.M.T. to their customers, and for their own use.

See your Republic representative. He can supply you with complete information first-hand. Or use the coupon below and write direct.

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ANOTHER 230 KV TRANSFORMER

Westward bound—a 15,000 kva, single phase oil-immersed, water-cooled power transformer recently completed by Wagner. *High voltage:* 230,000 Grd. Y/132,800 volts. *Low voltage:* 6900 Delta volts. Provision is made for conversion to forced-oil-cooling to maintain 100% rating. This unit is part of an order for ten 230 KV power transformers.

Wagner has been building fine power transformers since 1893, and today's production brings you the benefits of the skills and experience gained during these 65 years.

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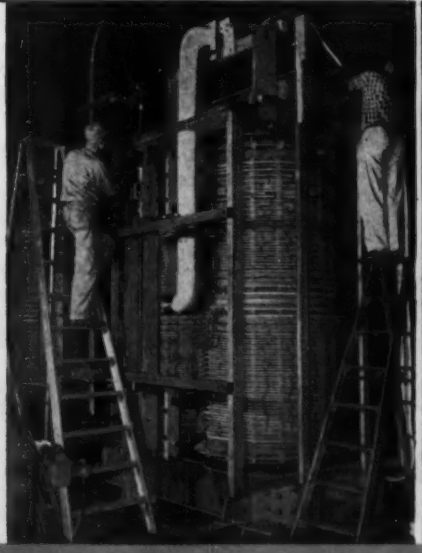
Two coils forming one double disk section of a high voltage buffer coil are wound simultaneously, with extra thick paper insulation.

The low voltage winding is placed over the core legs with the skill and precision of long experience.



The completed core and coil assembly is locked rigidly into place—ready for the final insulating barriers.

Lowering the core and coil assembly into its tank is one of the many exacting jobs that are part of the day's work at Wagner.

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Ends costly pipe-fitting work . . . simplifies future expansion

Armorlokt - the cable with its own built-in flexible conduit!

Tiger Brand Armorlokt Cables are insulated conductors encased in a flexible metallic armor which is applied at the factory. *Thus you get conductors and conduit in a single integrated unit.* And Armorlokt has a greater current-carrying capacity than conventional wire in rigid conduit.

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Tiger Brand Armorlokt Cables are available in a complete range of sizes and constructions. Just ask your AS&W salesman. Or write direct to American Steel & Wire, 614 Superior Ave., N. W., Cleveland 13, Ohio.

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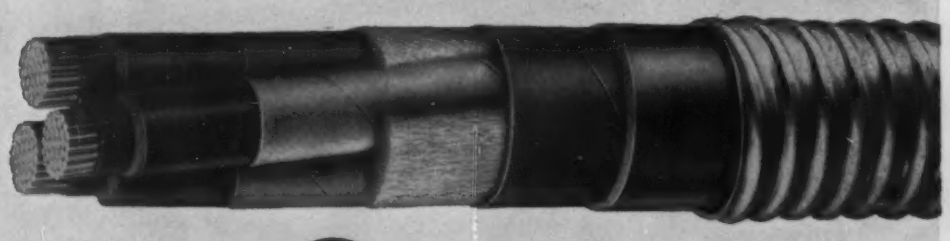

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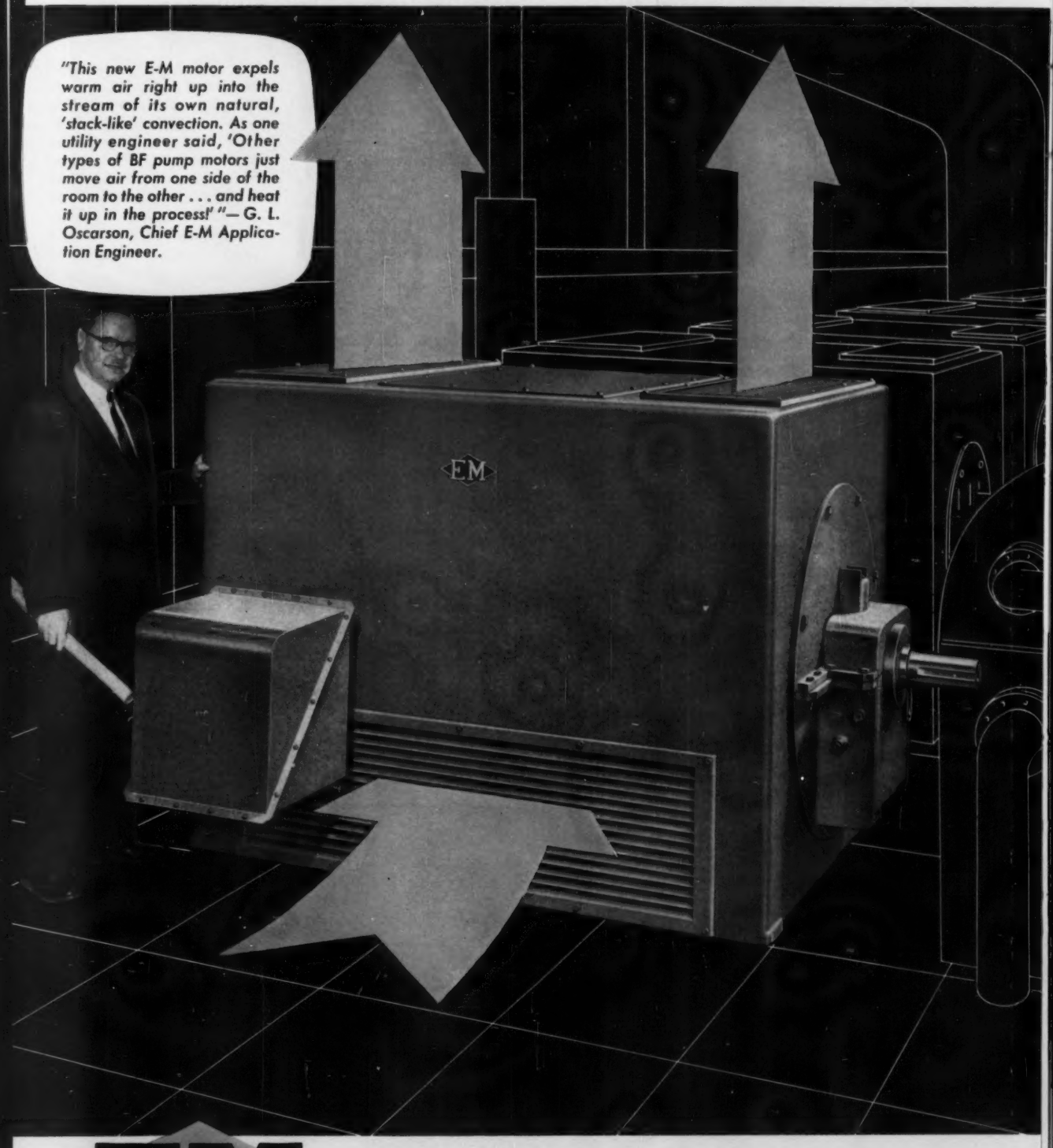
Power plant engineers asked for it!

New Straight-Up-Ventilated


"This new E-M motor expels warm air right up into the stream of its own natural, 'stack-like' convection. As one utility engineer said, 'Other types of BF pump motors just move air from one side of the room to the other . . . and heat it up in the process!' "— G. L. Oscarson, Chief E-M Application Engineer.
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E-M *designed it! Here it is! The...*

Boiler Feed Pump Motor

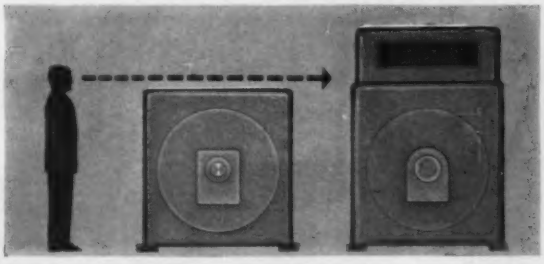
Blows warm air straight up and away!

It has FOUR GREAT NEW FEATURES you've always wanted:

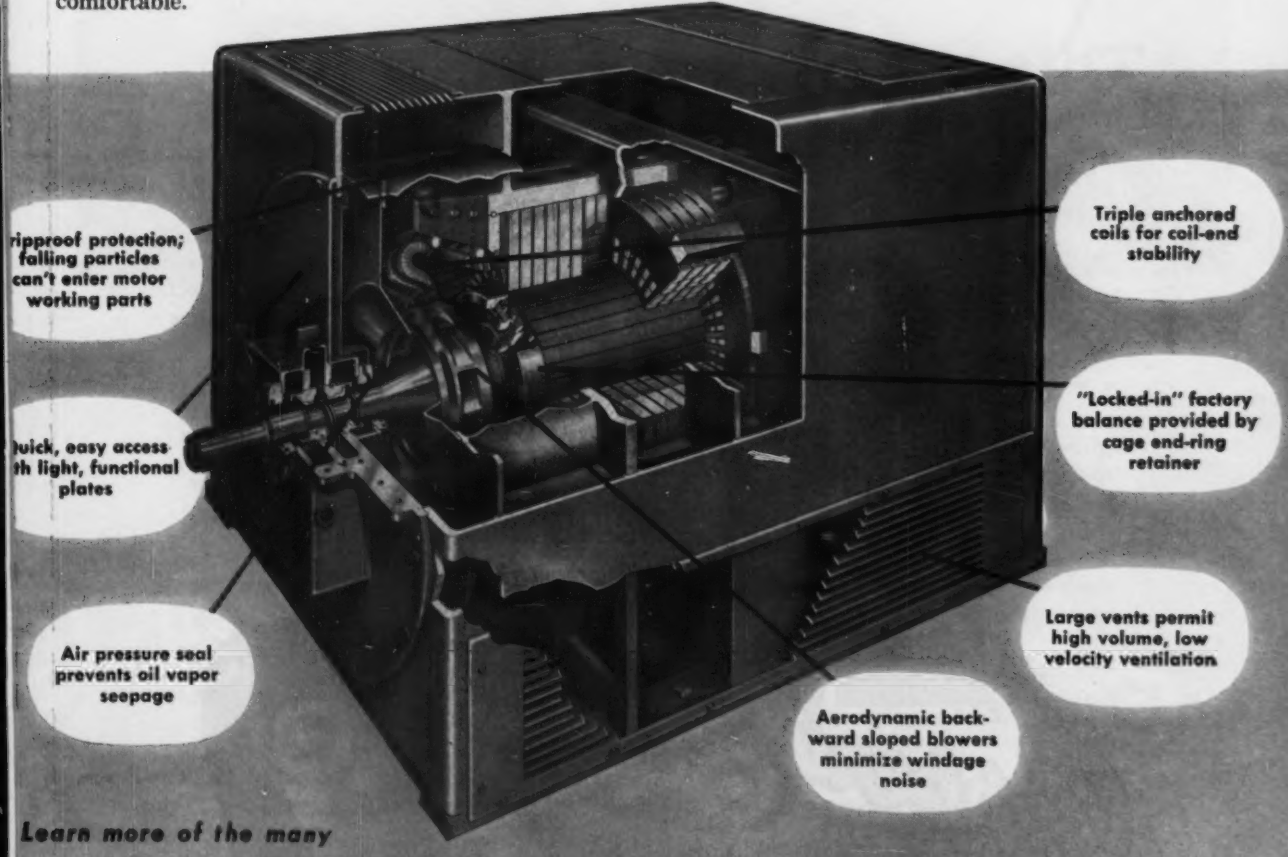
1. NEW TOP DISCHARGE. The new E-M motor ejects ventilating air straight up from the top. The heated discharge air rises straight to the ceiling.

2. COOLER INTAKE AIR. Split-level inlet-outlet prevents cross circulation and recirculation, permits close motor spacing.

3. GREATER OPERATOR COMFORT. No more "face blasting". The new E-M Motor eliminates warm air build-up at operator level, makes work more comfortable.



4. BETTER VIEW OF PUMP ROOM. View-blocking superstructures are gone. The new E-M design is low, modern, compact.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This guy is growing fast!

Born just last year, the new Copperweld* Type M Guy Strand has become the fastest growing guy in the field. Men in the telephone, power, and railroad industries have helped it grow. They have welcomed Type M to their immediate family of products, and with it has come real economy. It sells at new low prices, thanks to Copperweld research and new production techniques. And it saves in yearly maintenance since Copperweld requires no upkeep—a fact long established.

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A Job for Paul Bunyan...

Building Swift Dam on the Lewis River in southwestern Washington is the type of project that would have appealed to Paul Bunyan, the Pacific Northwest's legendary performer of giant tasks. For it will be the world's highest earth and rock-fill dam when completed—512 feet high and containing 16 million cubic yards of compacted materials.

Swift Dam and its adjacent powerhouse is being developed by Pacific Power & Light Company, Portland, and a companion powerhouse three and one-half miles downstream is under development by Cowlitz County Public Utility District #1, Longview, Washington, as an integrated project. The dam, the two powerhouses and other facilities will be completed near the end of this year—adding 274,000 kw capacity to supply the expanding power needs of the Pacific Northwest.

Working closely with power company and utility district engineers, Bechtel designed and engineered the entire Swift Project and is managing all construction.

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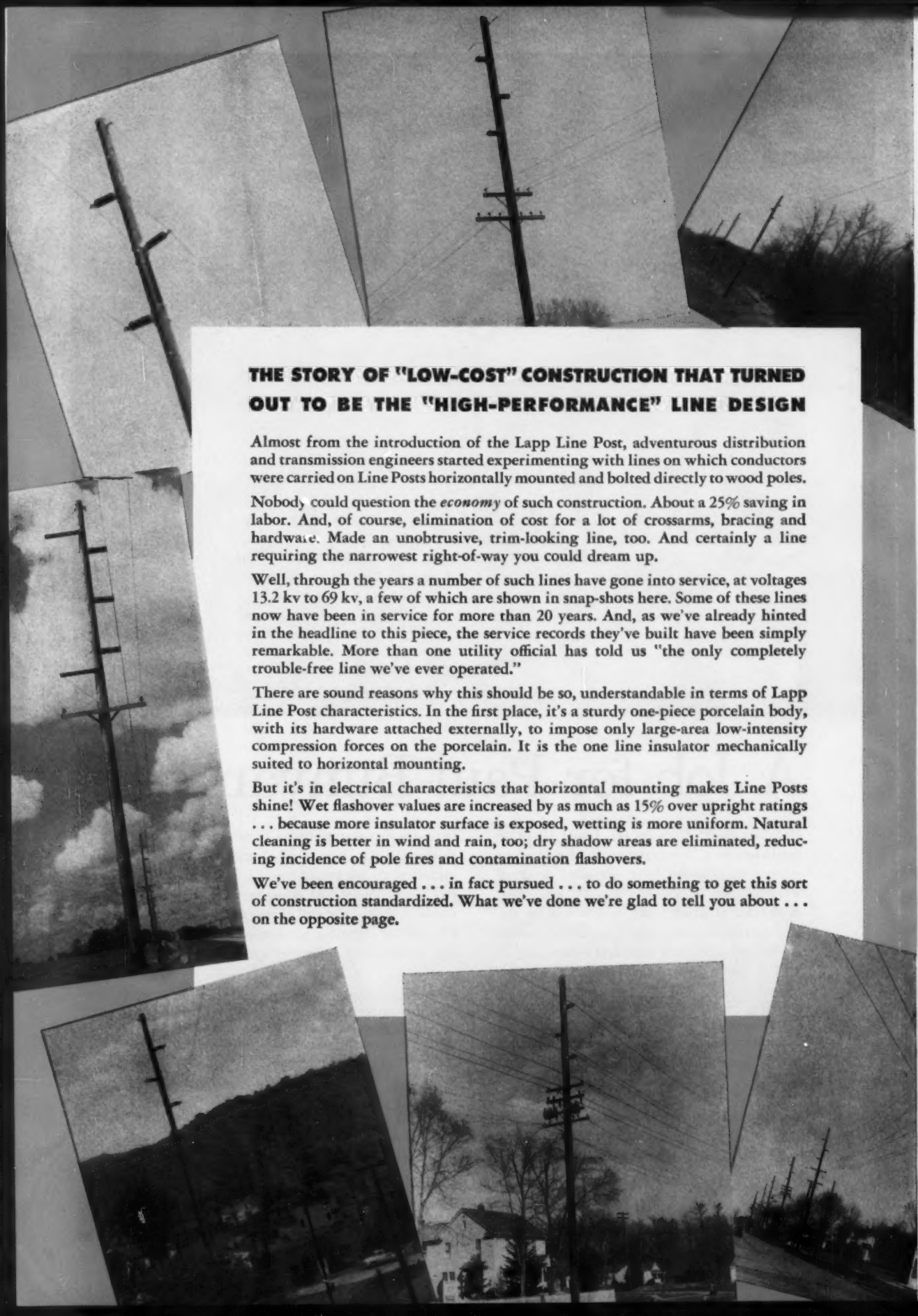


THE STORY OF "LOW-COST" CONSTRUCTION THAT TURNED OUT TO BE THE "HIGH-PERFORMANCE" LINE DESIGN

Almost from the introduction of the Lapp Line Post, adventurous distribution and transmission engineers started experimenting with lines on which conductors were carried on Line Posts horizontally mounted and bolted directly to wood poles.

Nobody could question the *economy* of such construction. About a 25% saving in labor. And, of course, elimination of cost for a lot of crossarms, bracing and hardware. Made an unobtrusive, trim-looking line, too. And certainly a line requiring the narrowest right-of-way you could dream up.

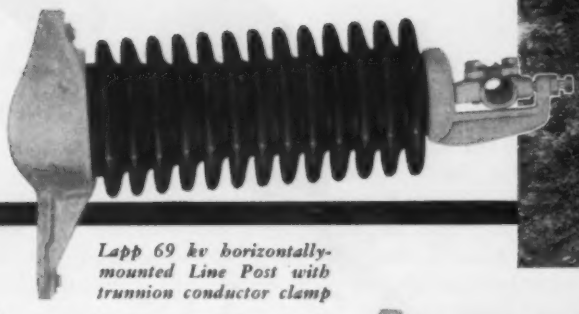
Well, through the years a number of such lines have gone into service, at voltages 13.2 kv to 69 kv, a few of which are shown in snap-shots here. Some of these lines now have been in service for more than 20 years. And, as we've already hinted in the headline to this piece, the service records they've built have been simply remarkable. More than one utility official has told us "the only completely trouble-free line we've ever operated."

There are sound reasons why this should be so, understandable in terms of Lapp Line Post characteristics. In the first place, it's a sturdy one-piece porcelain body, with its hardware attached externally, to impose only large-area low-intensity compression forces on the porcelain. It is the one line insulator mechanically suited to horizontal mounting.

But it's in electrical characteristics that horizontal mounting makes Line Posts shine! Wet flashover values are increased by as much as 15% over upright ratings . . . because more insulator surface is exposed, wetting is more uniform. Natural cleaning is better in wind and rain, too; dry shadow areas are eliminated, reducing incidence of pole fires and contamination flashovers.

We've been encouraged . . . in fact pursued . . . to do something to get this sort of construction standardized. What we've done we're glad to tell you about . . . on the opposite page.

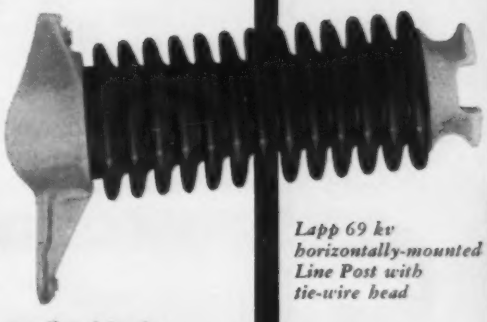
Entire structure is easily assembled on the ground before erection



Lapp 69 kv horizontally-mounted Line Post with trunnion conductor clamp

and now...

LAPP LINE POSTS SPECIFICALLY DESIGNED FOR HORIZONTAL MOUNTING



Lapp 69 kv horizontally-mounted Line Post with tie-wire head

A new series of Lapp Line Posts for horizontal mounting is now offered in six voltage ratings: 35 kv, 45 kv, 55 kv, 66 kv, and 88 kv. The bases are malleable iron castings with a mounting radius which will provide maximum contact to Class 1, 2 and 3 poles. Insulators are bolted directly to the pole by bolts at top and bottom of the base. This design provides that full cantilever strength of the insulator be developed with little deflection, and without failure of pole or mounting bolts. (Compare this with typical crossarm construction, where failure of braces or splitting of crossarm would occur at a value far less than the 2800 lbs. for which the insulator is rated.) In addition, longitudinal loading is possible at a value at least 50% more than can be withstood by crossarms. This extra strength permits use of longer span lengths, larger conductors and greater factors of safety.

By use of a simple outrigger shield wire and ground wires, it is practical and economical to achieve a structure flashover value with horizontally-mounted Line Posts greater than that of a typical wood-crossarm wood-brace vertical insulator assembly . . . with no possibility of wood burning or splitting. This is explained in Lapp Data Sheet No. 539, a copy of which is yours for the asking.

Lapp

LAPP INSULATOR CO., INC., LE ROY, N. Y.

if *your cable must endure...*

—turn to Kerite with assurance. For Kerite's wide range of quality insulated cables are unrivaled for *on-the-job* dependability and economy under all types of operating conditions.

In actual use, Kerite cables have been examined, salvaged, and returned to stock after as many as 50 years of continual service.

So we think that we may properly say: when quality and long life are essential . . . you can rely on Kerite.

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KERITE CABLE

it's the **KERITE** *that makes the difference*

Editorial Comment

DECEMBER 8, 1958

The Future Role of an Authority

"The future role of the Authority (Power Authority of the State of New York) should be dynamic, not static. It should go forward and accept its share of the greatly expanding need for electric power. It should retain its independence and its ability to influence power policies in the public interest. It should look ahead and plan now for those things it must do in the years ahead, to make the best use of its resources and to augment those resources as needed."

This is a quotation from the summary and recommendations of a report to the Power Authority of the State of New York by Major General Thomas F. Farrell. It is understood that this report has been agreed to in principle by the Board of Trustees of the Authority.

The provisions for carrying out this policy proposal quoted above are enumerated in the report (see page 66).

In summary, the proposal is similar to those of other power authorities. It includes a transmission network, steam plants, and nuclear power. Of course as we have heard in the past, these fuel plants would be required for firming the hydro and to provide for a claimed deficit in capacity of 500,000 kw expected to occur about every 12 or 13 years.

Although the report recommends that "agreements be negotiated between the Authority and the private utilities for interchange of power," no mention is made of the possibility that the private utilities could provide the interconnection capacity and the generating capacity required to firm up the hydro.

The basis for this plan is stated in the report in the following terms:

"In order to continue to wield its influence for the public welfare the Authority should adopt a dynamic role and go forward." And in an earlier statement it is admitted that "With a static role the percentage of the total power needs met by the Authority would gradually reduce, as also would its ability to influence action for the public benefits."

If anyone in the industry ever had any doubts about the ultimate aim of public power authorities, they need only to read this report. However, we have never seen such a weak basis for proposing expansion.

Too Many Industry Conferences?

Specialization among professional men continues to increase due to the complexity of our business and technical problems. With this specialization we have seen a continuing growth in the number of associations and committees within associations. We have also witnessed an increase in the number of conferences on specialized subjects.

This whole trend is well directed. It provides an important contribution to adult education.

However, the time is rapidly approaching when our zeal for more associations, committees, and conferences may be creating wasteful activities. For instance, there might be less need for more independent conferences if associations assumed responsibility for covering all of the important industry or technical problems in their area through regular committee programs.

This is a complex subject which needs and deserves careful consideration and study. It is suggested that industry and professional associations like EEI and AIEE give this matter top level attention.

Air Pollution: Tougher Controls

Rulings like the fuel oil restriction in Los Angeles Basin could set the pattern for other areas despite utility lead in use of pollution control equipment. Impact of growing public concern already influencing plant site selection

Earlier this year Electrical World ventured out on an unoccupied limb to define the power company industry's five most pressing problems.* Now air pollution or, more broadly phrased, the growing public pressure for cleaner air must be added.

Based on developments of recent weeks, the problem has come close to getting top billing for some utilities. For instance:

- The Los Angeles Air Pollution Control District put into effect a rule prohibiting the burning of fuel oil with sulpher content in excess of 0.5% by weight. The rule applies during April 1 to Oct. 31.
- Following a study by the Public Health Service, the Louisville, Ky., City-County Air Pollution Control Board took under consideration a recommendation that the board reconsider its "no" vote on a coal-sulphur-content ruling. If adopted, it would up electricity costs some $2.9 million, or 14%, a year.
- In Washington, D. C., a report on animal experiments has linked air pollution to diseases, including cancer, according to Surgeon Gen Leroy T. Burney, Public Health Service head. He told the First National Conference on Air Pollution that "cancers can be produced with urban smog" and reminded more than 900 delegates that the human lung cancer mortality rate in big cities is double that of non-urban areas. Absolute proof of the link has not been established, Dr Burney admitted, but "to wait for it is to invite disaster."
- More cities are re-examining present air pollution control ordinances and enforcement machinery. The trend is pressured by both a growing body of research findings on detrimental effects of air pollution and an increased awareness of a public "willing to stand up and fight for cleaner air," as one health official put it.

* The others: Federal encroachment, finance, engineering, employee-public relations and rights-of-way.

A six-county San Francisco Bay Area Pollution Control District, for instance, is drafting standards that will be submitted to the agency's board in February. The regulation would deal with results rather than type of control. San Bernadino and Orange counties have limited sulphur dioxide content of emissions to 0.2% by weight, particulates to 0.4 grain per cu ft, and opacity to the state standard of No. 2 on the Ringelmenn chart for more than three minutes in one hour. Riverside County is formulating regulations also.

Tougher controls aren't an immediate prospect in other cities contacted by EW. Sale Lake City is not expected to alter its relatively stiff ordinance. Denver plans "to do a lot more in the way of planning and study" before changes might occur, said P. W. Jacoe, director of occupational health.

No state or local tightening is in store for Atlanta, a Georgia Power Co man said. The same goes for cities on the TVA system. A bill to establish a Boston metropolitan air pollution commission was defeated in the Massachusetts legislature's last session.

A. L. Penniman, Jr, Baltimore Gas & Electric Co vice president, said, "In my opinion, relations between investor-owned electric utilities and air pollution control agencies have never been better." He added, though, "the finger of suspicion always points to the fella with the highest chimney."

After attending the Washington conference, utility men got the impression that most of the delegates want to see controls kept at local levels.

"Controls should be on the basis of the pollution area" was the consensus reported by one. "If it's all in one city, that's where it should be controlled, and the same for the county."

Walter S. Cooper, counsel for the New York-New Jersey Interstate Sanitation Commission, suggested going a step farther. He said a regional control board could best handle the research, coordination, and comprehensive programming for control and prevention of air pollution in the nine states from Massachusetts south to Virginia and the District of Columbia.

Reaction to this was noncommittal at the conference, said a power company man. And a New York City health official opined that the regional agency would be an unnecessary layer of administration for a problem that wouldn't exist "if local cities did their job."

No Change Seen in Federal Role

Will federal controls follow if these cities do not do "their job"? Probably not, judging from talks at the capital conference, but the precedent does exist in matters of water pollution. Sen Thomas H. Kuchel (D-Calif.) told the delegates he will introduce legislation next year to "implement, extend, and carry forward Public Law 159"—the three-year-old measure providing federal air pollution research and investigations. He stressed his conviction that "actual control over air pollution sources and causes was and must be a local and a state responsibility."

There's more than a touch of irony in the prospect of power companies being blanketed by a cloud of tighter air pollution regulation. For most of the companies, use of electrostatic precipitators dates back to 1930 or earlier. Improvement in equipment has brought current ash removal efficiency of the newer precipitators to 98%.

More efficient generating units and the retirement of old stoker-fired machines has helped to reduce power plant smoke discharge despite increased fuel consumption.

These industry developments were paid a left-handed compliment by the Washington, D. C., conference as emphasis was devoted to other sources of pollution. But, admittedly, a great deal of research remains for power companies, particularly in the plant emission of sulphur dioxide and nitrogen oxide,

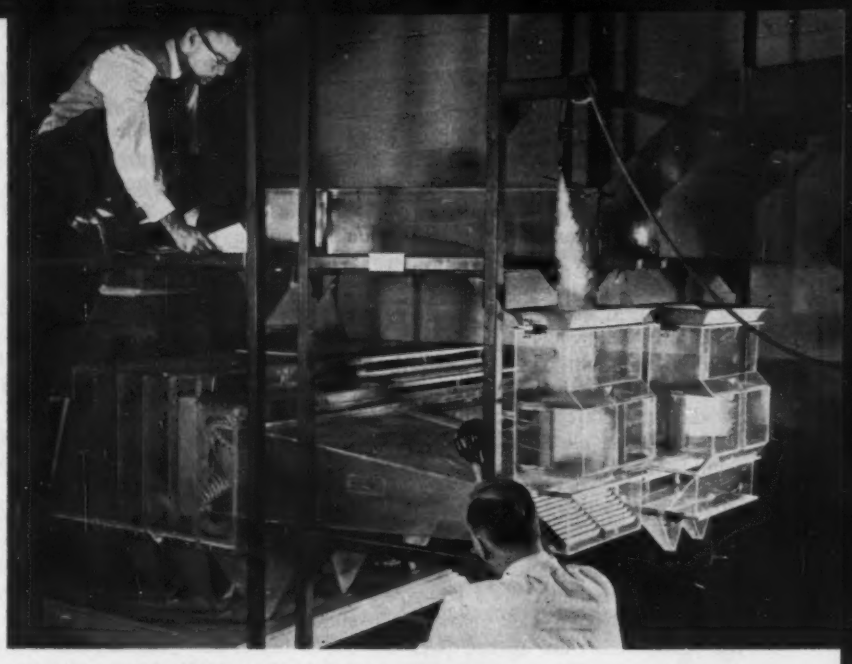
on the Way?

said a power company man in the East. This may be aggravated by the trend to larger generating plant capacities, he added.

As for the impact of air pollution controls on electric utilities, the over-riding one at present is cost. And this goes beyond the $1-million cost for today's big precipitator.

One power company man at the Washington meeting told Electrical World that he was attending to get the "feel" of how pollution controls were shaping up. His utility is planning a 400-Mw coal-fired plant near the firm's headquarter city.

Ideally, the plant would be built on a nearby river site. But there is a chance that the sulphur dioxide in coal fumes would combine with fog condensate from the cooling towers and produce sulphuric acid, he said. The alternate location is on a lake shore about 20 miles farther away. The company estimates it would earn close to $500,000 more a year through lower transmission costs to locate on the river site.



FLOW PATTERN OF SMOKE is studied by Research-Cottrell, Inc, engineers on model of precipitator and stack flue slated for use in two Con Edison plants. The New York utility has spent $38 million on air pollution control since 1953

Con Ed Spends $38 Million

Consolidated Edison Co of New York, Inc, has spent about $38 million since 1953 on a long-range program to reduce stack emissions, according to testimony at a recent FPC hearing. Dr Leonard Greenburg, commissioner of New York City's Air Pollution Control Dept, appeared before the FPC to recommend approval of applications by Transcontinental Gas Pipe Line Corp and Con Ed to bring natural gas into the city. Besides helping to meet the utility's winter peak, the gas would be burned in two boilers of mid-Manhattan plants, which Dr Greenburg said were heavy contributors to air pollution.

The FPC has deferred its decision on the proposed contract.

In Chicago, Commonwealth Edison Co has spent nearly $18 million on precipitators. Besides this equipment, added expenditures have gone for stacks up to 450 ft high for better dispersion of stack gases. Cyclone furnaces are playing an important part. Latest models of the furnaces remove 75% of the ash from gases. Precipitators used on the same units remove 88% of what is left of the ash. The extra money spent on cyclone furnaces for ash removal has not been included in the $18 million estimate.

Commonwealth Ed has taken relatively aggressive steps to achieve a positive public relations reaction to its air pollution control efforts. When new units were going in at the Waukegan station, pictures and releases of the precipitators went out to newspapers during construction. At the new Ridgeland station, the company held an open house for people in the neighboring area. They were shown the pollution control equipment and the special stack design. The company also measured flyash fall in the Ridgeland plant area before and after each unit was put in service. The results indicated that Ridgeland was not making any substantial increase in the fall.

Los Angeles Utilities Skeptical

In Los Angeles, the industry's most critical area on air pollution matters, utilities are skeptical about the feasibility of Rule 62, which prohibits the burning of fuel oil of more than 0.5% sulphur content during the smog season. There is some doubt that gas will be available on a firm, uninterruptible basis. And there is a suspicion that conversion to a one-fuel economy will move gas prices upward in the absence of competition.

In 1955 a pollution control program was drawn up by the Joint Power Plant Research Council, a group comprised of representatives from Southern California Edison Co, the municipal agencies and the APCD. The council's prime purpose has been to develop mechanical means of capturing contaminants emitted during the burning of fuel oil. This research has been partially successful in that Edison's El Segundo steam plant will put into operation at the first of the year a $1-million precipitator. This experimental unit will capture solid materials going out in waste gases from the stacks of the plant. That should mean a cessation to the visible plumes from the stacks and a lessening of some of the soot fallout. If the unit proves successful similar units will be placed in all of the Los Angeles county steam plants.

Sulphur and ash contained in fuel oil is another area of the council's study. Since nobody can say that future scientific development could not result in an economical, low-sulphur fuel oil, the door was left open to year-around use of fuel oil by imposing the 0.5% by weight sulphur limit, rather than specifically prohibiting any use of fuel oil.

One thing that legislation can

never resolve is the design and operation of the plants themselves. Things like better boilers and burners, improved equipment that completely consumes whatever fuel is used are areas being explored by the council not only from a pollution standpoint, but in the financial interest of the utilities themselves.

Sulphur control is the most immediate problem. The APCD estimates that steam generating electrical plants are responsible for about 80% of all the sulphur compounds in the Los Angeles county atmosphere.

Another problem is the emission of oxides of nitrogen. The APCD says that power plants are second only to auto exhausts as a contributor of nitrogen oxides. However, the automobiles are spread over a 12,000-sq-mi area.

What happens with the nitrogen oxides is that they mix with the hydrocarbons that emanate from refinery stacks, producing substances that irritate the eyes, reduce visibility and damage growing plants. Among the substances produced are aldehydes, formaldehydes and formic acids. And with the pattern of locating both steam plants and refineries along the seaboard, there is a blending of oxides of nitrogen and refinery hydrocarbons.

Experiments by Edison have given preliminary evidence that by careful flame control in the combustion equipment oxides of nitrogen emissions can be reduced 40-50%. But experiments are not yet far enough along to indicate specifically what ought to be done in the way of flame control.

Zoning on Plants Discussed

One item under discussion by the APCD that might have far-reaching effects on electrical utilities is the possibility of new planning and zoning regulations. With the possibility of 12 million people in the county by 1975, careful consideration is going to be given to the location of electrical utility facilities. What very well could happen is that the utilities will have to build their steam plants outside the county and build new transmission lines to bring the power into the county.

The APCD already feels that the Los Angeles basin can't handle any more power plants that contribute to pollution, and is making it a habit of denying applications to construct new steam plants within their jurisdiction. Edison, when it applied to build the El Segundo steam plant, was denied permission by the Air Pollution Control officer. They appealed to the Air Pollution Control hearing board which granted them a temporary variance which said, in effect:

"You may violate the law for a temporary period, but during that period you must bring operations into compliance with the law." This variance was issued for the maximum one-year period and was extended for another year because Edison was able to show certain progress in controlling pollution, viz. the precipitator. And, Edison is currently operating the El Segundo plant under this variance.

N.Y. Agency Bids for Expanding Role

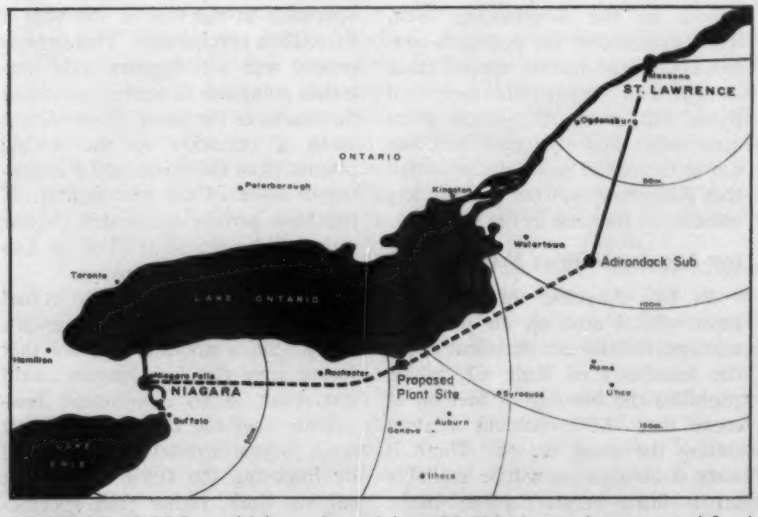
Bills now in works to permit building of coal-fired and A-plants by Power Authority

The New York State Power Authority should seek enabling legislation for the construction of nuclear and thermal generating stations to firm up power produced at the St. Lawrence and Niagara projects.

This was proposed last week by Maj Gen Thomas F. Farrell, consultant to the authority, in a report on the relation of water to other power in plans of the agency. A spokesman for the power authority said the trustees approved Farrell's proposals "in principle," but that there might be some variance on the details he suggested.

Bills are now being prepared to cover the needed legislation authorizing "the Power Authority to act for New York State in all activities dealing with the development and use of nuclear power . . ." the report said. The proposed legislation would also "authorize the authority to build and operate thermal power plants."

The report explores the feasibility of 400 to 500-Mw plant that would be located in the vicinity of Sodus Bay near Rochester. An extra-high-voltage transmission line,



FIRMED-UP HYDRO could be achieved by 400-500-Mw nuclear or coal-fired plant near Sodus Bay, says consultant. EHV link (dotted line) already is definite

"which the authority has decided to build," would interconnect the proposed thermal or nuclear plant with the hydro projects.

Suggesting that "the authority could properly act for the state in the development of nuclear power," the report said that power production costs could be achieved at costs competitive with coal-fired plants, "with an appropriate subsidy." A "substantial amount of energy" would be available for sale to private utilities for distribution.

Farrell noted that existing AEC policies would not provide enough federal assistance to make the proposed nuclear plant competitive but "the policies could be liberalized in the future; perhaps as a result of action by Congress."

The authority's engineers, Uhl, Hall & Rich, projected the costs for a 400-Mw, 2-unit coal-fired plant as "one solution for firming up the capacity of the hydro plants and for providing substantial additional amounts of energy." Capital cost per kw would be $173, based on financing and operation by a public agency, with fixed charges of 7% of construction cost.

The thermal plant would be operated as a base load facility with the Niagara plant carrying peak requirements, the report said. "By interchange agreements with private utilities, it should be possible to market any surplus energy made available by the steam plant."

Link Would Be Advantageous

Because the loads of neighboring private utilities are supplied mainly from steam plants, "there is an opportunity for the authority and the private utilities to make an interchange arrangement which will be mutually advantageous," the report said. Exchange arrangements for both water flow and energy at St. Lawrence have already started with Ontario Hydro.

Farrell's report turned thumbs down on the use of Canadian natural gas for the proposed thermal station. It also declared gas turbines were not feasible.

The report opines that "in order to continue to wield its influence for the public welfare, the authority should adopt a dynamic role . . ." or else "the authority projects would become minority elements of the great growing power business."

New Neuberger Bill Aired

Revised Columbia River Development Corp bill interpreted as tougher in some ways in aim for giant federal power system

Sen Richard Neuberger's new Columbia River Development Corp bill gets a going over beginning today in the four Columbia Basin states—Washington, Oregon, Idaho and Montana.

Hearings are being held in Seattle, Portland, Coeur d'Alene and Kalispell.

His new bill is being interpreted as both softer and tougher on private utilities than his previous bill (S-3114) depending on which clauses you read.

Most of the changes in the new bill appear to have been made to answer criticism from interested federal agencies: Army Engineers and the Bureau of Reclamation. Both bills are the products of the Northwest Public Power Association.

New Bill Is Different

Utility spokesmen emphasize, however, that it is a mistake to compare the two bills, as the new one is only faintly related to its predecessor. Although both bills are aimed at the same goal—a huge federal power system in the Northwest—the two use different wording to accomplish the same goal.

By its length and more complicated wording, the new bill is "far more dangerous to private companies," a utility spokesman said, as many passages can be interpreted in different ways.

In several respects, the new bill is tougher than its predecessor:

- The corporation would be authorized to acquire, construct and operate atomic power plants to back up its hydro projects. (The earlier bill would have permitted conventional thermal plants, but didn't mention nuclear.)
- The corporation is deprived of the power to condemn land for thermal and nuclear plants but no prohibition is made for hydro-electric sites.
- The corporation's condemnation rights are broadened to provide for comprehensive development and conservation of resources in the Columbia Basin. (The previous bill assumed the condemnation authority in the Bonneville Act, which is limited to the sale of excess power.)

On other points, the new bill apparently would go easier on electric companies than its predecessor, which was introduced in January, 1958.

Limit Set on Bonded Debt

- The corporation would be limited to a $750-million total of bonded indebtedness to the U. S. Treasury at any one time. No private financing would be authorized. (The previous bill did not limit the bonded debt.)
- The corporation would be authorized to intervene in any case before the Federal Power Commission to challenge license applications for new projects in the Pacific Northwest. (The earlier bill called for non-federal power systems to obtain a permit from the corporation before they could seek an FPC license.)
- On federal multi-purpose projects, where the corporation would pay for, construct and operate the power plants, Congress would have to appropriate funds to the Army Engineers or Bureau of Reclamation to build the non-reimbursable features (irrigation, navigation, etc.) before the project could be built. (The previous bill permitted the corporation to build its own multi-purpose dams without relying on other federal agencies.)
- The corporation would be prohibited from taking steam power plants in its area by condemnation. (Previously, condemnation would have been authorized by the corporation under the wording of the Bonneville Act.)

Neuberger also has included his proposed controversial modification of the Bonneville preference clause in the new Columbia River Corporation bill, but under softer wording.

When Congress convenes, Neuberger is expected to introduce a third version of his proposed legislation, based on the outcome of the December hearings.

TVA's Purchasing Plans Protested

Allis-Chalmers contends the agency's terms and conditions on equipment favor foreign manufacturers while discriminating against U. S. firms, taxpayers, and labor

With the contract for three 60,000-kva water-wheel generators for TVA's Wilson Dam still pending, Allis-Chalmers Manufacturing Co executives lodged a vigorous protest with the TVA board of directors, on Nov. 24, against the anticipated purchase of the equipment from a foreign firm.

Allis-Chalmers was apparent low domestic bidder among six firms, three domestic and three foreign, that bid on the TVA job. All three foreign bids were lower and it was one of Allis-Chalmers main contentions that terms and conditions of the specifications favored foreign manufacturers over U. S. companies. In an earlier protest, when the job was first offered, General Electric Co charged that liquidated damages clauses in the specifications favored foreign firms and declined to enter a bid.

Among the six competing firms, Brown Boveri of Switzerland was low bidder on an evaluated basis for the Wilson Dam machines. They offered the only firm price bid and exceeded specified efficiency of 97.1% by 0.8%. All other firms accepted escalation clauses in the TVA invitation. The unevaluated bids were these: Brown Boveri, $2,639,000; American Elin, $2,542,000; English Electric, $3,103,000; Allis-Chalmers, $4,290,000; Westinghouse, $4,495,000 and Elliott, $4,654,000.

Policies Curb Competition

It was evident from the timing, the vigor, and the nature of Allis-Chalmers' protest that the issue ran deeper than dollar values, efficiencies or matters of escalation. Under contention was the strong and growing conviction among U. S. manufacturers of heavy electrical equipment that the purchasing policies of federal agencies unfairly favor foreign firms; that they discriminate against the U. S. businessman, laborer, and taxpayer; and that the high level of American wages, standards of living and taxes make it impossible to compete for federal contracts against cheap foreign labor.

It was significant, too, that the Allis-Chalmers spokesman was its Vice President J. L. Singleton, also president of NEMA, whose efforts to bring about a revision of federal policy on foreign purchases of power

SINGLETON: 'Responsibility to play fair'

apparatus are currently making headlines (see p 69).

Speaking at the hearing before the TVA board, Singleton emphasized that he was there to plead a cause and the principle concerning the growing problems of heavy power equipment imports. Many people in TVA and in other business organizations, he said, feel the need for reappraisal of this mounting problem. He acknowledged that the Allis-Chalmers group was on hand in an effort to be helpful.

"Your purchasing of this large quantity of heavy electrical apparatus abroad is ignoring your responsibility to play fair by spending money our government collects in the same kind of economy from which it gets it," he said.

The direct loss in the Allis-Chalmers generator shops was estimated by Singleton at 400,000 manhours of work. Additional hundreds of thousands of manhours will be lost in the U. S. because work is transferred from American suppliers to those of another country, he said.

While acknowledging the necessity for helping friendly countries through aid and trade, Singleton said: "We cannot continue to pour our tax dollars into these foreign countries. We must find some other way to accomplish the same end result . . . to raise the standard of living of friendly countries without lowering our own."

Far-sighted businessmen and companies feel the best way to do this is by investing our knowhow in friendly countries . . . building up business and becoming a working factor in the economy of these countries, he conceded.

Favoritism Charged

Regarding TVA's invitation to bid on the Wilson Dam generators, Singleton said: "The terms and conditions appear to favor foreign manufacturers. Evidently TVA does not have complete confidence in such manufacturers and has therefore attempted to provide protections by liquidated damages in the event that a foreign manufacturer should be low bidder . . .

"The invitation seems so designed to facilitate bids from foreign manufacturers in that:

1. Generators are being ordered sooner than required by the production cycles of U. S. manufacturers.

2. The need for manufacturers to have a competent crew available in the U. S. for installation of generators is eliminated by TVA assuming responsibility for installation.

3. Specifications state that foreign bidders are exempt from the following general conditions: Domestic materials, non-descrimination, Walsh-Healey Act—all of which contribute directly to the cost of production of U. S. manufacturers.

4. Evaluation procedures are established for comparing foreign and domestic bids which appear to favor foreign manufacturers with low evaluation of foreign inspection costs."

In concluding his presentation Singleton said: "We hope this trend does not continue, but if it should, then we would refrain from the many conferences we have had with TVA engineers and other suppliers to develop bigger and better equipment. It's a matter of plain economics. When we know foreign competition is involved, we will have to refrain from preparing proposals because it is impossible for us to compete with foreign business. We will have to save this expense.

"It is quite evident that we cannot compete with foreign bidders with the differential in labor rates being what they are," he concluded.

Following the hearing with officials of Allis-Chalmers, the TVA board stated: "Foreign bids are considered and purchases made when they would contribute to economical operation. Such purchases are in conformance with the national policy of the United States with respect to international trade."

The board called attention to the fact that the Allis-Chalmers bid is subject to upward adjustment before the equipment would be delivered. The Swiss bid offers TVA a saving of between $1,400,000 and $1,700,000 or between 35 and 40%. The board said that over a 25-year period TVA purchases have totaled slightly over $2.1 billion, of which only about ¼ of 1% of the total has been spent abroad.

Decision Expected Soon on Import Question

Study may be completed by Christmas on GE, NEMA petitions charging imports impair American national security

U. S. manufacturers of heavy electrical equipment may know soon whether the Eisenhower Administration plans to take a stand against the rising tide of imported power equipment — turbines, generators, transformers, circuit breakers and switchgear.

Officials of the Office of Civil and Defense Mobilization want to complete by Christmas their study of petitions filed by General Electric Co and the National Association of Electrical Manufacturers (NEMA), which call for a finding that such imports are endangering the national security.

After OCDM comes up with its ruling, the White House will give it a final ok.

GE's request on imports protection under Section 3(d) of the Buy American Act is unique. Normally, such petitions are filed with other government agencies which use the products involved (Interior Department, Defense Department, etc.) for findings, and then the White House makes a final decision, bypassing OCDM. Both the GE and NEMA petitions—also seeking a ruling under Section 8 of the new Reciprocal Trade Act—are the first to complain that the national security would be hurt more by use of the imported equipment than by detrimental effects on the domestic producers of competitive products. Lengthy delays in repairing imported equipment could seriously hurt needed generating capacity during an emergency, they say, and reliance on initial deliveries of equipment from overseas factories could be a questionable practice during unsettled times, especially when deliveries are scheduled for up to two or three years in the future.

Decision by OCDM on the petitions has been delayed for several months because of an inside-the-administration fight over whether imported power equipment performs at high enough efficiency levels, and whether delays in initial delivery time or major repair work should be taken into consideration on bids.

Evidence of this fight came to the surface in September, when the Defense Department—under pressure of the State Department—eased a "repair and test" clause in an Army Engineers invitation for new power transformers at the Fort Peck dam. An Italian manufacturer, Legano Electric Corp, had complained to the State Dept that this clause was discriminating against foreigners, because the Engineers interpreted it to mean that foreign manufacturers had to own their own repair and test facilities in the U. S. or Canada, capable of handling all repairs on equipment they bid on.

Then State asked the Pentagon to remove the clause entirely in the interest of improving foreign trade relations; the Pentagon later compromised by softening the clause to mean that repair facilities could be leased or maintained either in the U. S. or Canada through contractual arrangements with other companies or institutions.

In November, the Pentagon cancelled all bids on the Fort Peck transformers, and is re-advertising for new bids on the same specifications as before, except that on schedule "C" of the invitation—a three-phase autotransformer — the required efficiency level has been reduced a tenth of 1%.

The State Department has filed its recommendations with OCDM on the imports petitions, as have the Atomic Energy Commission, Tennessee Valley Authority, and Commerce Department. The Defense and Interior recommendations are due at OCDM during November. The Interior recommendation —because it includes the Bureau of Reclamation's views—is expected to carry a lot of weight in settling the issue at OCDM. Likewise, the Pentagon views, including those of the Army Engineers, will be considered carefully.

GE and NEMA are complaining that the federal government is placing too much emphasis on price when it awards contracts for heavy power equipment—too little on performance. As a result, the government has relied increasingly on foreign-made equipment for big hydro power projects, and this imported equipment, GE and NEMA say, has caused lengthy outages for repair when there is a breakdown.

Pressure-Tube Reactor Unlimited

Carolinas Virginia Nuclear Power Associates' reactor has pressure tubes and heavy water for coolant and moderator

E. C. FISS, Engineering Director,
Carolinas Virginia Nuclear
Power Associates, Inc, Charlotte, N. C.

A pressure-tube, heavy-water moderated and cooled reactor, which Carolinas Virginia Nuclear Power Associates, Inc., is designing, offers many advantages, a most important one being that the reactor concept has no size limitation. The concept has been approved by AEC and the Joint Congressional Committee, and AEC and CVNPA are negotiating a contract on the first three steps of this program:

1. Research and development, along with engineering of a plant design, for early 1960 completion.

2. Construction of a prototype plant having a gross electrical capacity of 19 Mw which is expected to be finished by mid 1962.

3. Continuing research and development during operation of the prototype plant to determine optimum core and component designs and provide data for accurate evaluation of a 200-Mw or larger plant. This will take until mid 1967.

4. A commercial nuclear power plant, rated at 200 Mw or larger, will be constructed when the plant can be expected to be competitive. Construction is expected by one or several of the CVNPA members—Carolina Power & Light Co, Duke Power Co, South Carolina Electric & Gas Co, and Virginia Electric & Power Co.

The reactor's selection stems from a study which considered three

Adapted from a paper presented at the Southeastern Electric Exchange Engineering & Operation meeting, Biloxi, Miss.

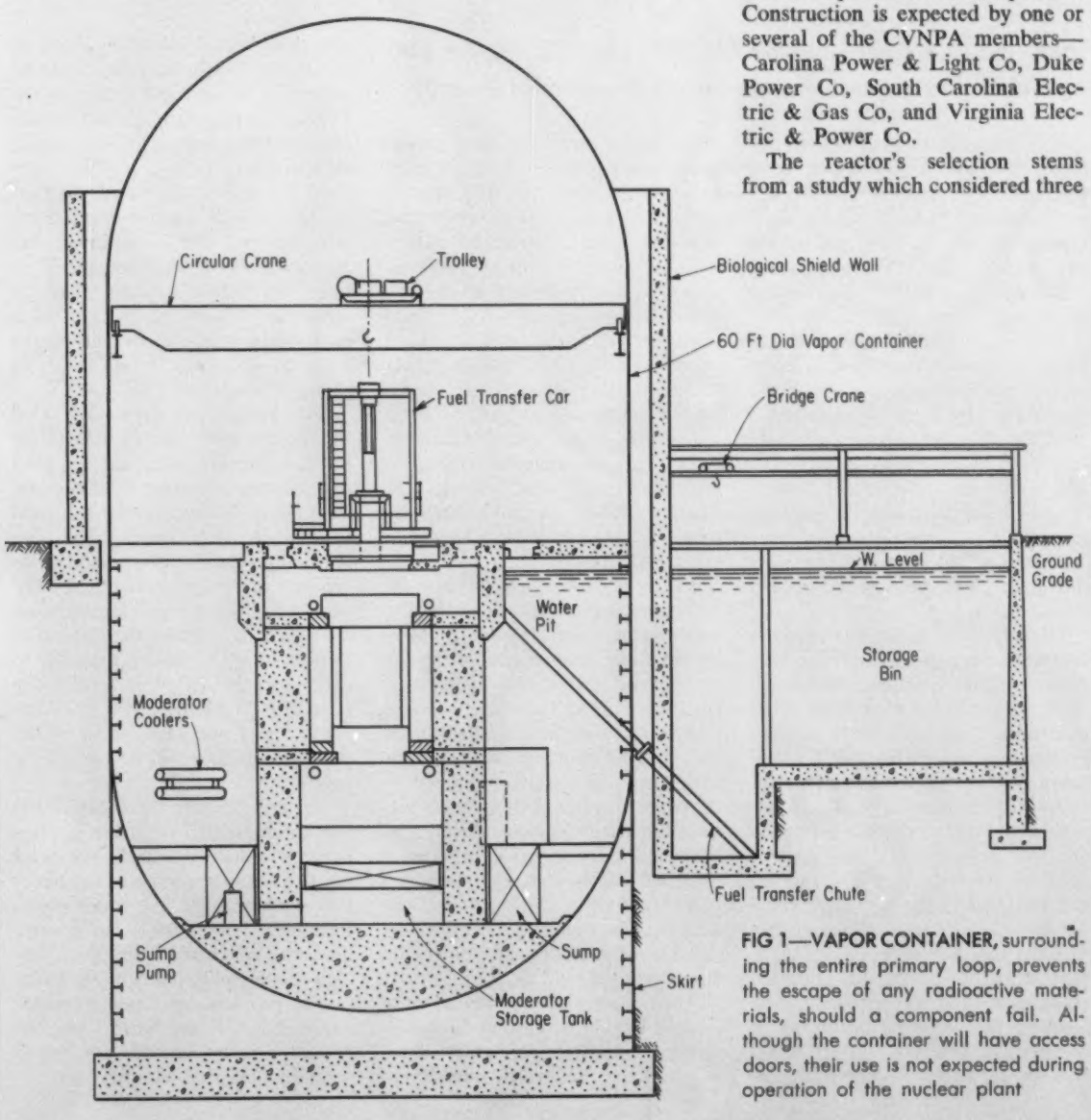


FIG 1—VAPOR CONTAINER, surrounding the entire primary loop, prevents the escape of any radioactive materials, should a component fail. Although the container will have access doors, their use is not expected during operation of the nuclear plant

in Size

other designs: Pressurized water, similar to the PWR and Yankee Atomic Electric plants, but with some improvements; sodium-cooled, using zirconium hydride as a moderator instead of sodium graphite; and a boiling heavy-water design. Study of these four concepts deduced that none would be economical now. Yet the sodium-cooled and the pressure-tube designs could be constructed for plants much larger than 200 Mw, and the latter appeared to be the only one qualifying under AEC's third invitation.

The prototype pressure-tube reactor will have 85 vertical pressure tubes, each about 3 in. in dia and 18 ft long. They will be assembled, along with the control rods, to form a core approximating a right cylinder 80.5 in. in dia by 105 in. high. A pressure tube will contain two fuel elements and the circulating heavy-water coolant. Each fuel element will consist of 19 Zircaloy fuel tubes, probably a half inch in diameter and 50 in. long, filled with uranium dioxide pellets. Initial fuel charge for the reactor will be 8,500 lb of uranium dioxide slightly enriched to about 2% of U-235.

The reactor will have a designed thermal capacity of 60.5 Mw, and a burnup rate of 8,000 to 10,000 Mw-days per ton of uranium, or 15,000 full-power hr per core. At this rate, about 1% of the fuel can be fissioned to produce energy before elements need replacement.

The core of pressure tubes and control rods will be surrounded by an unpressurized aluminum vessel in which an aluminum divider will separate moderator and reflector regions, both moderator and reflector being heavy water. The moderator will be circulated through a heat exchanger for removal of about 4½ Mw of heat from absorption of gamma rays and conduction of heat through the pressure tubes. Circulation rate will be 385,000 lb per hr, and the moderator's temperature will range from 120F at the inlet to 160F at the outlet.

Pressure tubes, extending through the top and bottom shields of the moderator tank, will be connected to headers. Heavy-water coolant will be circulated by two 3,850-gpm canned rotor pumps, and the coolant loop will operate at 1,500 psi. The heavy-water coolant will leave the pressure tubes at 574F, will flow through the system at 3.2 million lb per hr, and will reenter the reactor at 526F.

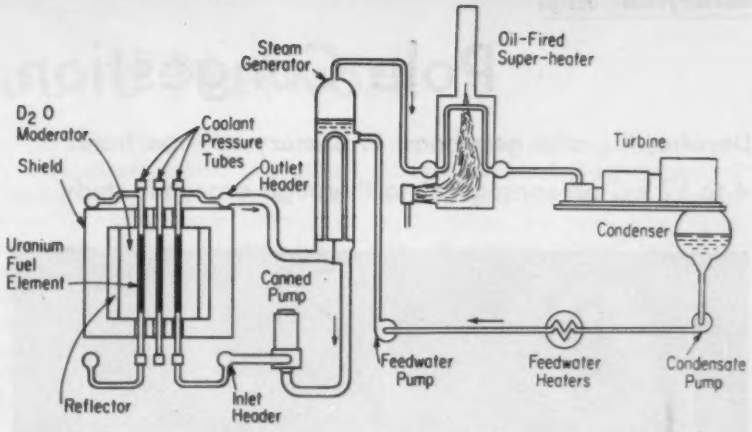


FIG 2—STEAM GENERATOR is designed to give 203,000-lb-per-hr steam at 700 psi from light water. Steam, superheated to 725F, will drive existing turbines

In the secondary loop, the steam generator will yield 203,000 lb per hr of dry and saturated steam from light water at a pressure of 700 psi. This steam will be raised to 725F in an oil-fired superheater.

Design Offers Advantages

In general, the pressure-tube design has these advantages over other plant designs:

1. As pressure tubes are smaller than pressure vessels, transportation of components and the replacement of fuel elements are easier.

2. Failed tubes should be more easily located, as the tubes can be monitored individually for radioactivity in the coolant.

3. As control rods operate at atmospheric pressure in the moderator, there is no penetration of a high-pressure vessel.

4. Boiling of the coolant does not affect reactivity significantly, the coolant contributing little to moderating the reactor.

5. Reactivity changes less in going from cold to hot operating conditions, as the moderator is always cool.

6. The heavy water as coolant and moderator improves neutron economy.

7. Fissionable materials are used more efficiently.

8. Natural uranium can be used in larger sizes.

9. Most reactor parts are replaceable.

Housing the entire primary loop in a vertical cylindrical steel vessel will positively assure that radioactive materials will not escape. This vapor container will hold safely all energy and materials that could be released by component failure. Shielding will be earth and concrete walls.

Although the vapor container will have access doors, it is not expected that they will be used during operation. Equipment within the container will be controlled remotely from an adjacent building, where there will be space for storing fuel elements, auxiliary equipment, a repair shop, etc. In another building, radioactive waste materials will be separated from the heavy water, whose complete recovery will be necessitated by a cost of $28 per lb. The 75,000 lb of it required will have a value of about $2.1 million.

Gas waste materials will be treated to recover deuterium, and residual gas will be stored in tanks for several months to allow natural decay of most of the radioactivity. They will then be diluted with air and discharged through a high stack, as regulations prescribe.

The plant site is adjacent to a 72.5-Mw steam plant of the South Carolina E&G, whose turbines will be powered partially by steam from the nuclear plant. Thus the prototype reactor and its auxiliary equipment will be capable of operation substantially above design capacity of 19 Mw, enabling the determination of ultimate capability.

Pole Congestion, Load Growth

Decatur, Ill., also gets boost in primary voltage from 4 to 12 kv, all consequent to thorough economic study

S. R. BUTLER, T. W. SCHROEDER, Illinois Power Co, Decatur, Ill.

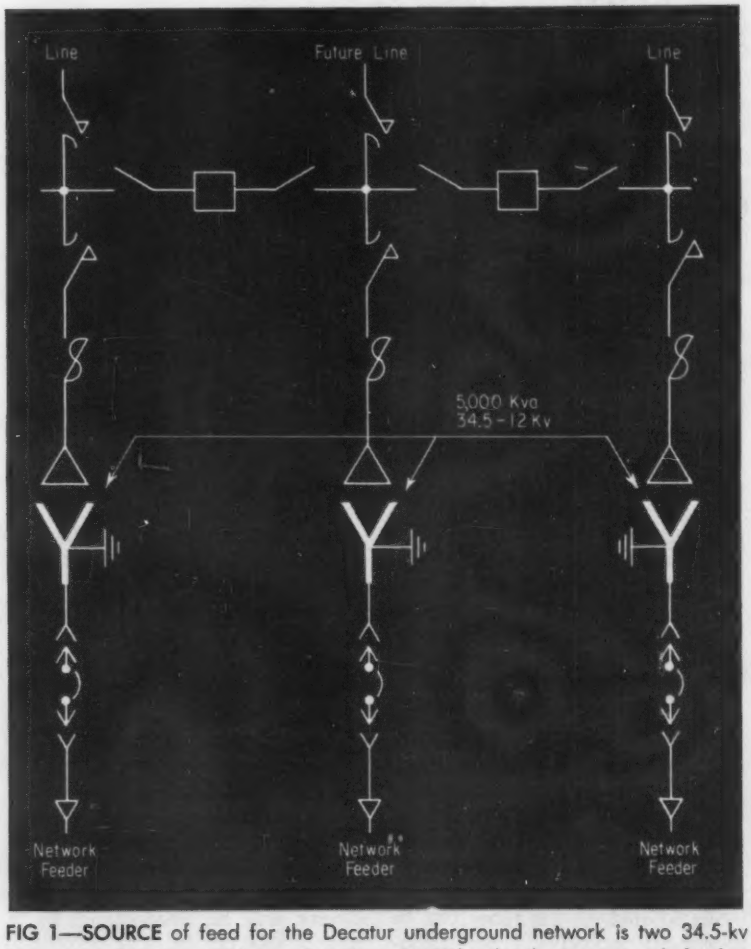


FIG 1—SOURCE of feed for the Decatur underground network is two 34.5-kv lines into substation which supplies three 12.46-kv distribution network feeders

Illinois Power Co has changed distribution in the downtown business section of Decatur, largest community served by it, from an overhead radial to an underground network system. Decatur's metropolitan area has a population of about 100,000. The downtown commercial area of 15 sq blocks has a load density of 60,000 kva per sq mile.

Chief considerations in the change to an underground network were the congestion of the overhead system and the need for increasing capacity to meet load growth, which would mean only more overhead congestion. Primary voltage of the radial system was 4,160 v. Of the six circuits feeding the area, three were loaded beyond design limits. Four circuits occupied the same pole line.

Secondary service was at three voltages: 120/240 v 3-wire, single-phase; 240 v 3-phase delta, and 208Y/120 v 4-wire. There were distribution transformers on almost every pole. This combination of many primary feeders, three secondary systems, and many transformer stations, congested the alleys. It was difficult, if not impossible, to maintain clearances between buildings or fire escapes and the distribution equipment. Service continuity was becoming a prob-

Economic Study of Decatur Underground Network

	Revenue Forecast	Accumulated Dist. Invest.	Accumulated Gen. & Trans. Invest.	Total Invest.	Present Worth of Revenue Forecast	Present Worth of Annual Charges
1956	$583,000	$830,400	$1,499,400	$2,329,800	$583,000	$483,882
1957	617,980	830,400	1,606,757	2,437,157	584,115	478,439
1958	655,061	830,400	1,721,801	2,552,201	585,363	473,672
1959	694,634	1,655,000	1,845,082	3,500,082	586,549	613,828
1960	736,027	1,655,000	1,977,190	3,632,190	587,423	602,069
1961	780,186	1,700,100	2,118,757	3,818,857	588,494	598,272
1962	826,997	1,744,700	2,270,460	4,015,160	589,649	594,584
1963	876,618	1,744,700	2,433,025	4,177,725	590,753	584,731
1964	929,214	1,789,300	2,607,229	4,396,529	591,816	581,569
1965	984,968	1,789,300	2,793,907	4,583,207	592,951	573,041
1966	1,044,065	1,833,900	2,993,950	4,827,850	594,073	570,541
Total	$8,726,750	$1,833,900	$2,933,950	$4,827,850	$6,474,186	$6,154,628

Bring Underground Network

lem, as some circuit failures interrupted many customers.

In analyzing the alternatives, these were the considerations: Should the new system be overhead or underground? Should a radial system or a secondary network be installed? Should the primary be 4 or 12 kv?

As congestion was a problem and continued load growth a certainty, the underground system was favored. It would eliminate clearance problems, improve appearance in the downtown areas, and be less vulnerable to lightning or fire.

A secondary network was preferred to a radial system because:

1. Full advantage is obtained from diversity among loads because transformers supply a common grid.

2. The network system reduces voltage flicker.

3. More uniform voltage is maintained along secondaries.

4. Transformers and feeders may be taken out of service for inspection and maintenance without interrupting service to any load.

5. Customers' service is not interrupted by faults on a primary feeder or transformer.

6. New loads and load growth may be taken care of with less distribution planning and less incremental system addition.

Economics dictated the 12-kv primaries. Additional substation capacity would have been required soon to serve downtown and nearby residential loads. Cost of cable and distribution equipment would be less, were the downtown area served at 12 kv. By serving the downtown area at 12 kv, substation capacity and circuit positions were released for serving other areas.

An economic study indicated that consumption in the area could provide an adequate return on the investment for an underground network supplied by 12-kv primaries. Step-by-step analysis for 1956-1966 (see tabulation) showed that present worth of the forecast revenues exceeded the annual charges.

In checking annual rate of return, it was evident that rate of return for the years following the construction expenditures would be somewhat below average. But the ability of the underground network to take on added load without extensive added expenditures provides a return above average in other years. Over the period considered, the rate-of-return study substantially verified the results in the tables. A longer period was not considered, as expenditures beyond the study period would be chiefly for transformer and cable capacity.

The first section was completed and energized in November 1956 and transfer of load from the overhead system was completed in June 1957.

After work on the first section had started, discussions with representatives of the company's gas department revealed that extensive expansion of downtown gas facilities was planned. By making minor changes, the same route was used for the gas and electric systems over much of the area. As a result of this, the schedule for the second underground section was stepped up by about two years. Combining the two projects avoided tearing up the streets twice. The gas main was laid above and to the side of the electrical ducts. Crews completed transfer of load in May of 1958.

The substation serving the network area has two 34.5-kv incoming lines. Three 5,000-kva transformers supply three feeders at 12.46 kv. They are arranged so that two feeders remain energized when one transformer or either 34.5-kv line is out of service. As load increases and additional capacity is needed, more transformers and feeders will be installed.

The primaries feeding the network are 350 MCM and No. 1/0 copper conductor. The cable is

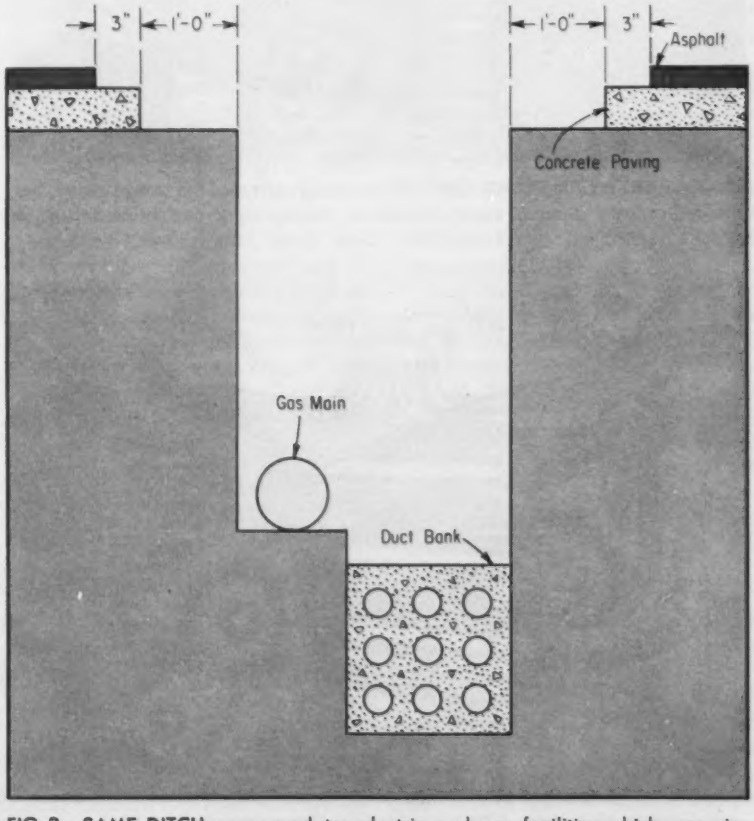
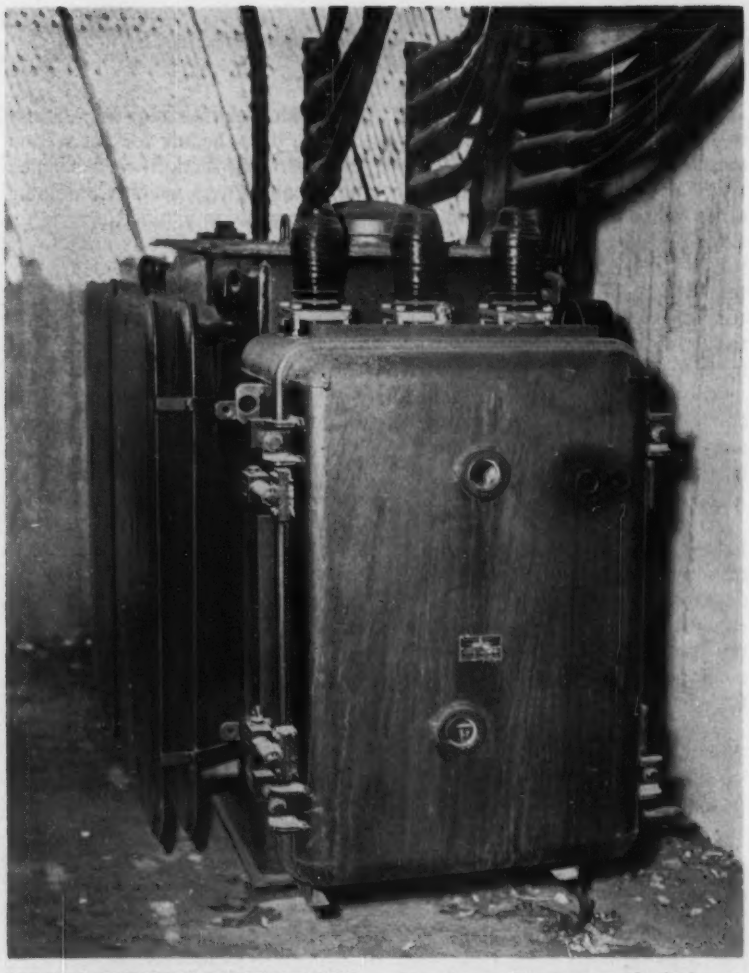
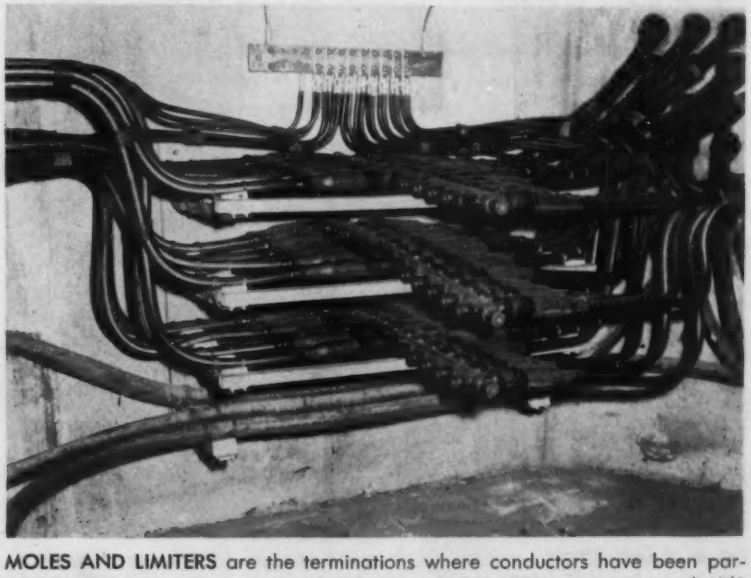


FIG 2—SAME DITCH accommodates electric and gas facilities which were installed together. Joint effort avoided opening downtown streets a second time



500-KVA NETWORK TRANSFORMERS are the short type, the use of which permits future installation of capacitors above the transformers for joint vault use



MOLES AND LIMITERS are the terminations where conductors have been paralleled to obtain more capacity. Conductors are 500-MCM copper; neutrals 4/0

three-conductor, paper-insulated, shielded, lead-covered, and has a Neoprene outer jacket. Rubber insulated cable was ruled out.

All network transformers are 500-kva units with 1,600-amp network protectors mounted directly on them. Low-height units were installed, as they leave adequate room in the vaults for mounting capacitors above the transformers. Since it is expected that corrosion will not present much of a problem, vault-type rather than subway-type transformers were installed.

Phases of the secondary system are of 500-MCM copper conductors with type RHW insulation. No. 4/0 was used for the neutral. Where additional capacity was required, conductors were paralleled. Moles and limiters are the terminations.

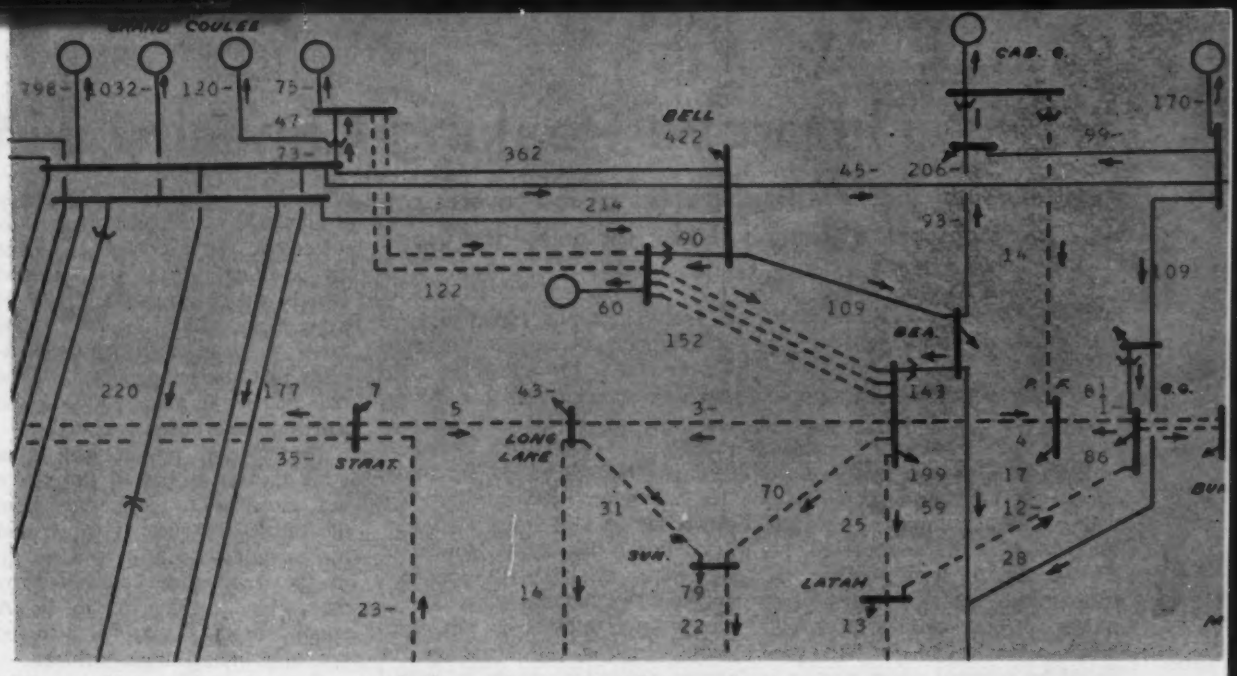
Conversion of secondary distribution to 208Y/120-v systems in the commercial areas of the company's larger towns was started in 1953. Customers were notified that the new service would be offered and were told that additional capacity or modernization on their own systems should be adaptable to the 208Y/120-v system.

Costs Shared

Where it was necessary to convert the service without benefit to the customer, the company paid the conversion cost. When the customer desired to increase his capacity at the time of the conversion, rather than wait until he needed the additional capacity, he shared with the company the cost of the conversion. The company paid the estimated cost of converting, but not of increasing the capacity.

Most services are not underground, but are fed by risers from the network system. When his load increases to the point where the overhead service entrance is inadequate, the customer is requested to provide the underground entrance. Many buildings have several service entrances, served from the risers and cables attached to the buildings. Future changes are being worked toward a single service entrance per building.

With the network system in service, it is expected that the basic distribution system for downtown Decatur is established for many years.



Direct diagram printout or tabular printout is obtained as . . .

Computer Solves Dc Load Flows

HARRY D. HURLESS, Electrical Engineer, Bonneville Power Administration, Portland, Oregon

A dc load flow program with direct solution printout on system diagrams has been developed by Bonneville Power Administration engineers for IBM 650 and 407 equipments. The program solves digitally the same set of linear equations usually solved on the dc network analyzer.

The IBM 650 previously had been programmed by BPA engineers for solving the same load flow equations handled by the ac network analyzer. Thus BPA now uses four methods of solving network load flow problems.

The dc method provides a relatively fast, though partial, solution. Only power flow (Mw) and approximate bus power angle are obtained. However, analysis of results by a competent engineer will give conclusive information except in the most critical cases.

Thus, the conventional method has been used in exploratory system planning work to narrow choice of possible system additions or changes from the myriad available. The two or three remaining possibilities then are analyzed more precisely, in analog form on the ac network analyzer, or on the 650.

The value of the dc digital program has been heightened by development of a scheme permitting direct printout of solution onto a system diagram, using the IBM 407 accounting machine. BPA more recently has extended this for use with the ac load flow program.

In the 650 solution of the dc load flow problem, the program and all required information are stored internally on the 2,000-word memory drum. The program includes several data checking routines, is completely automatic, and will accommodate a 200-bus system.

Solution of a 200-bus problem from uniform voltage start requires an average of one hr of 650 time. If bus voltages from a preceding case are available, solving time will average 45 min. These times are for a 7,800-Mw load to an absolute error of about 50 Mw. Precision of the solution is adjustable.

Answers are printed on the system one-line diagram by the 407 accounting machine. If several copies are needed, printout is on transparent diagrams for use with standard reproduction methods. Printout of a 200-bus system requires 10 min of 650 time and 15 of 407 time, representing sizable time and manpower savings over the manual transcribing required by the dc network analyzer.

Simultaneously with printout, output cards can be delivered, giving the full solution, coded to correspond with the diagram printout.

This program has been in use about one yr. Work continues to increase speed of convergence to the correct answer.

The digital method now is used for solving most of the dc load flows at BPA because of greater speed and fewer skilled personnel required. The dc network analyzer still is used for running small incremental flows where effects of system changes are confined to a small area and little saving would result from use of the digital method. It also does small rush jobs when the computer is busy.

Each of the two ac methods requires about the same amount of time. The digital method makes possible solutions to an accuracy allowing loss comparisons. This is not possible on the ac network analyzer. At this time, however, the ac analyzer provides the most convenient and economical method of making swing studies to determine system transient stability.

Improve Peaking Capacity with

Academic study indicates existing underground caverns can store large amounts of compressed air for peak-load usage

KENNETH RAZAK, Dean, School of Engineering, University of Wichita, Wichita, Kan.

Splitting a gas turbine into its separate components furnishes a novel way of solving the problem of smoothing out a system load curve. By driving the compressor with an electric motor at off-peak times, storing the compressed air, and feeding it back through the combustion chambers and rotor of a gas turbine during peak-load hours, a result similar to that produced by pumped water storage is achieved.

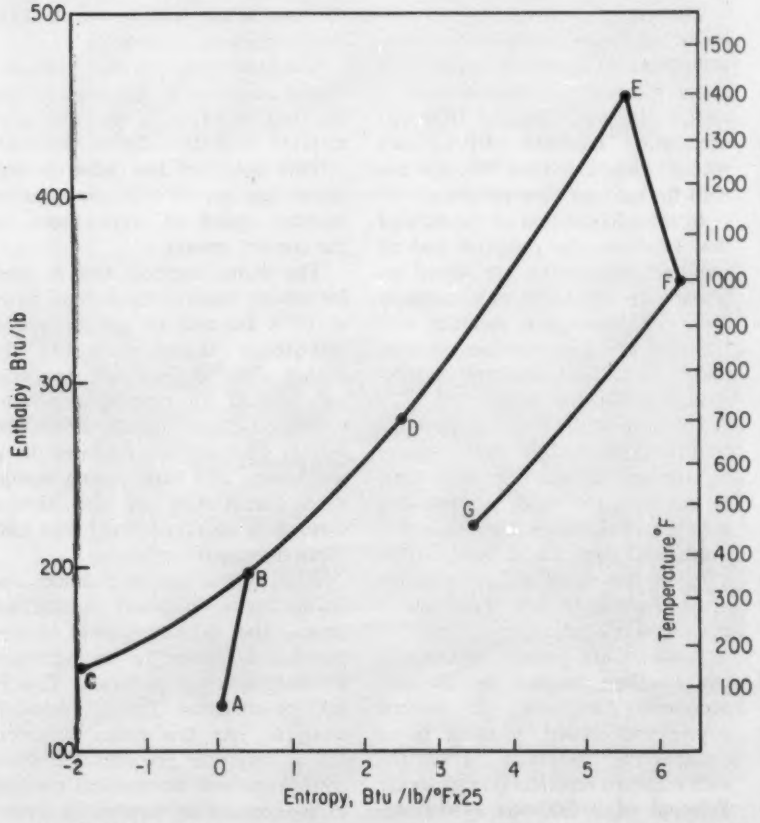
Power is drawn from the main distribution system at off-peak hours to compress air, using only the compressor section of a gas turbine engine. The air is stored in large underground caverns and held until the demand on the system begins to increase. Compression then stops, and the air is allowed to flow through the combustion chambers of the turbine, where fuel is burned, the alternator driven, and the power fed back to the system.

At first glance the economics of the system may not be apparent, because the thermal efficiency of simple gas turbines is not sufficiently high to be attractive for power generation except in special circumstances. In the energy cycle, events are shown on a combined enthalpy-entropy and temperature-entropy diagram (below).

Atmospheric air at A is compressed at point B. Cycle efficiency is increased as the pressure ratio is increased. After compression, the air is stored in the underground cavern, where some of the heat of compression will be absorbed by the earth. A conservative estimate indicates that the temperature will be reduced by at least 200F in the length of time that it is stored.

During the power generation cycle the air is passed through a heat exchanger to receive heat from the turbine exhaust, C to D, and fuel is burned to bring the gas up to the temperature permitted by the turbine blading, D to E. A temperature of 1,400F is assumed typical of industrial gas turbines.

Expansion through the turbine occurs with a non-isentropic expansion, E to F, with the drop in enthalpy being equivalent to the work being performed. The exhaust gases are then cooled in the heat exchanger, F to G, and exhausted to the atmosphere.



HEAT EXCHANGER brings temperature of air up to level permitted by turbine blading. Heating is accomplished by cooling of exhaust gases in heat exchanges

High Efficiency Possible

The energy added to the cycle consists of the electric power required to compress the air and the fuel required to raise the temperature. In the high pressure cycle, the electrical equivalent of 100 Btu is required to compress each pound of air and an additional 175 Btu are required from the fuel. The expansion produces 140 Btu of work. If this cycle were being performed as a simple gas turbine, the 100 Btu required to compress the air would come from the turbine, and the net output of the conventional gas turbine would be 40 Btu at a thermal efficiency of 17%.

In the energy-storage cycle, however, the entire output of the turbine wheel is being delivered to the system when it is needed. The wheel of a turbine-compressor combination that is ordinarily rated at 5,000 kw is actually delivering nearly 15,000 kw, with 10,000 kw being absorbed by the compressor. When operating in the energy-storage cycle, when the compressor is not being driven by the turbine, the net output of this cycle is 140 Btu. A thermal efficiency of 80%, based on the fuel consumed but not in-

Air Storage

cluding the power to compress the air, is achieved.

Calculations can be made to determine operating costs of the output power. They depend on fuel cost and the cost of the off-peak power absorbed by the unit. Assuming off-peak power to cost 3.0 mills per kwhr and a fuel cost of $0.20 per million Btu, the operating cost of the power fed back to the central system is about 3.65 mills per kwhr.

The cost of installation of the energy-storage system, exclusive of the underground storage cavern, reflects the greater capacity rating of the gas turbine wheel. Commercially available gas turbine plants cost about $215 per kw capacity. But a gas turbine rated at 5,000 kw that would cost about $215 per kw becomes a 15,000-kw unit when divided for installation in the energy-storage cycle.

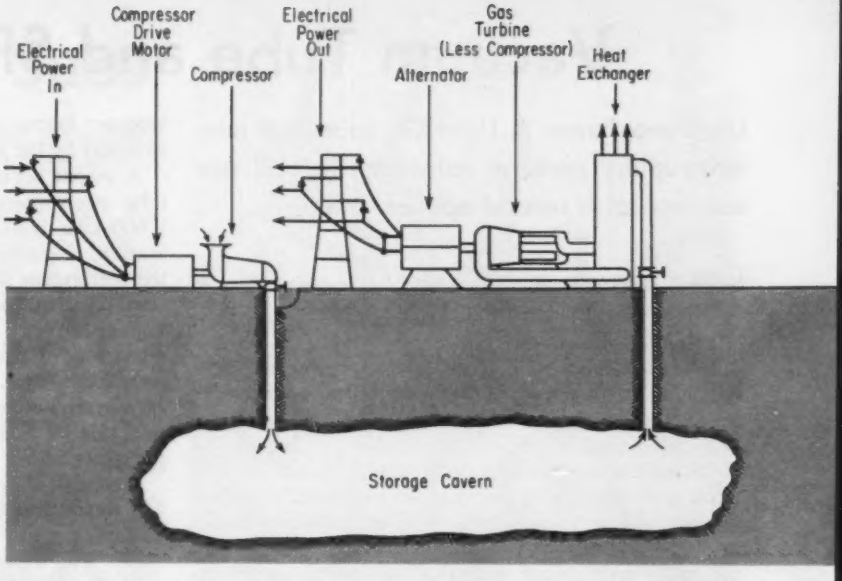
Allowing for the additional cost of the larger alternator, larger step-up gearing, higher capacity switchgear, and the motor required to drive the compressor, the installation cost has been estimated to vary from $90 to $105 per kw. Cavern cost should be about $50 per kw. For a plant with few hours of utilization per year, this lower capital cost reflects most favorably on the cost of power.

For a load factor between 20% and 25%, the total cost would be about 13 mills per kwhr.

This rate is quite high compared to plants that have been written off, but the projection of this energy storage cycle is being made on the premises that old plant capacity may not be sufficient for future peak loads, and base load plants will suffer accordingly when put on low load factor service. The consideration of a specific system load curve will make a more accurate calculation possible.

Gas turbines of 15,000 kw, the turbine wheels of which deliver 45,000 kw, are commercially available. This is enough capacity to be interesting to large systems.

There are many ways to increase the thermal efficiency of the energy storage cycle, each of which must be balanced against the capital cost, considering the number of operating hours per year. Examples are inter-cooling between compressor stages to reduce the work of compression, increasing the compression ratio to improve thermal efficiency, and utilizing residual heat in the exhaust after regeneration to generate low pressure steam.



OFF-PEAK POWER drives compressor, which stores compressed air in cavern. Air is used in turbine at peak-load hours. Compressor and turbine are separated

The key to the system lies in the method of storing the compressed air. An enormous volume of air will be delivered by the compressor in the several hours that it absorbs power. Storage of the millions of cubic feet necessary for any plant capable of storing a practical amount of energy is impossible in tanks of fabricated structures. Recourse must be had to either natural or man-made underground caverns.

Many Caverns Exist

Man has been burrowing in the earth for hundreds of years for various commodities, and extremely large voids exist in a surprisingly large number of places. Mining activities for all the metals and minerals have left many caverns.

Some coal mining companies would be very pleased to find an economic use for old mines. In some populated areas, subsidence of the ground due to caving in of old mines is causing legal problems and the companies involved would like to justify entering an old, mined-out area and shoring it up to relieve or eliminate a subsidence problem.

It is not difficult to visualize an agreement between a power company and a mining company to seal off and shore up a portion of an old mine to make it suitable for air storage. A previous liability to the mining company would then become a source of income as well as a solution to a problem.

Other mineral mines may be similarly used. Much of the Midwest and Central South is underlaid with beds of rock salt being mined by both direct and hydraulic excavation. Rock salt beds also exist in the Great Lakes area and upper New York State. The City of Detroit, for example, is resting atop a large salt mine. Beds of hydratable shale, hydraulically excavated, exist in many southern states.

Limestone mines are found in many sections of the country, often near concentrations of industry where peak-load power is at a premium. Quarries offer an opportunity for further excavation.

The possibility of manufacturing a cavern specifically for air storage cannot be discounted. Recent tests have shown the possibility of excavation using atomic blasts. If the power peaks are short, but of high magnitude, a smaller amount of energy is required to be stored and the storage cavern can be small in size. For short duration high-magnitude peaks, a high unit cost of excavation may be tolerated.

Vacuum Tube and SF_6 Interrupters

Louisiana Power & Light Co finds that new interrupters perform satisfactorily and are economical in several applications

HUGH B. BALFOUR, JR., Division Engineer, Louisiana Power & Light Co, West Monroe, La.

Louisiana Power & Light Co is trying two new switching methods for 115-kv capacitor banks with satisfactory results and economic savings. The methods and conclusions are:

1. Sulphur hexafluoride interrupters, based on 2½ years experience with one and several months with a second, will perform satisfactorily on capacitor banks up to 10,000 kvar at 115 kv. The interrupters provide the most economical means of automatic switching, based on initial cost.

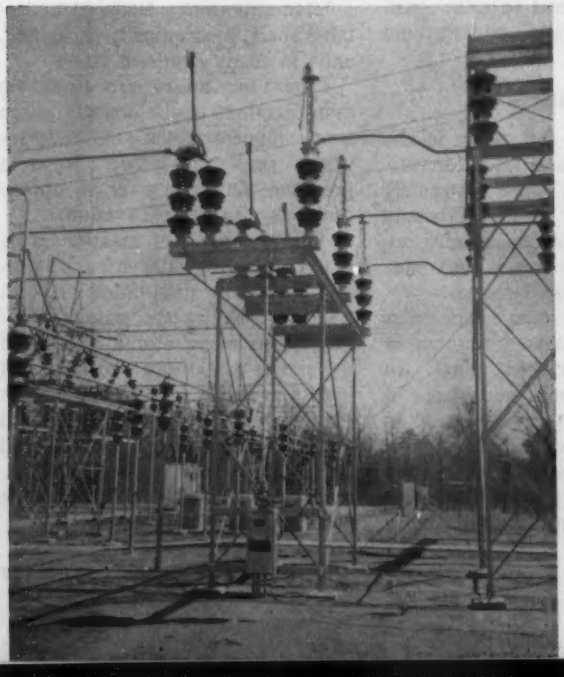
2. Vacuum-tube interrupters, based on only six months experience, have operated satisfactorily. They could prove as economical as any other switching means for capacitor banks of 10,000 kvar and are applicable to larger banks.

The company began investigating these switches to fill the gap between the air break switch and oil circuit breaker. The air break switch has limited interrupting capacity, particularly for capacitive currents. Oil circuit breakers are difficult to justify economically in many cases.

The first SF_6 interrupter was installed at the 115-kv Winnfield Substation, which is about 90 miles from generation and supplied over two parallel 115-kv lines. Because loss of one circuit would cause excessive voltage fluctuation, a 9,600-kvar capacitor bank switched by the interrupters was installed in 1955.

Adapted from a paper presented to Southeastern Electric Exchange Engineering & Operation Section.

VACUUM-TUBE INTERRUPTERS are also proving satisfactory for switching 115-kv capacitor bank at Bastrop Substation



A second set of SF_6 interrupters and one of vacuum-tube interrupters were installed in 1957 for 115-kv 9,600-kvar banks at Oak Grove Station and Bastrop Station, respectively. Use of these banks that are near the Sterlington steam station serves two purposes: Station reactive requirements are adequately met, and voltage support is obtained for heavily loaded circuits when loss of ties to the generating station necessitates back-feed from distant sources. Also, much better incremental control of var supply is obtained from the two smaller banks than from one large bank at the generator bus.

Controlled by a motor mechanism and timer, the SF_6 interrupter is used to switch a 115-kv 9,600-kvar capacitor bank "on" and "off" once a day, six days a week. The capacitor bank is ungrounded-Y with eight capacitor groups in series per phase and 16 25-kvar, 7,960-v units in parallel per group. Each capacitor is fused for 10 amp, and the bank is connected to the bus through 115-kv fused switches.

Capacitor-bank neutral is operated ungrounded to prevent undue carrier attenuation for carrier relaying on the circuits. Because of the ungrounded neutral, a special protective relay arrangement was developed to detect voltage unbalance caused by capacitor or fuse failures and to de-energize the bank before it is damaged by overvoltage. This relay scheme uses capacitor potential devices connected across each phase of the bank to neutral. Secondaries of these devices are connected in delta with one corner open to give indication to a sensitive voltage relay.

The voltage relay is set to operate the interrupter switch at 1.5-v unbalance after a 20-sec time delay provided by another relay. This setting permits one capacitor to fail without interrupting the bank and opens the switch when two or more units fail.

Installation of the 9,600-kvar bank at Winnfield Substation on July 29, 1955 was the first application of the SF_6 interrupter for capacitor switching. The bank was switched once a day, six days a week, eight months of the year, requiring 200 operations per year. Based on the manufacturer's life expectancy of 500 operations, the contacts would have lasted about 2½ years. But examination of the contacts after 150 operations showed negligible wear. Thus, contact life is expected to exceed 500 operations.

Three cases of trouble have occurred since installation. The first occurred three months after the bank was placed in service and involved a brake-pin failure in the motor mechanism. Eighty-four operations had been recorded at this time.

After one year in service, one phase of an interrupter exploded. Investigation indicated that a copper-braid connection inside the mechanism compartment had not been properly installed when the unit was assembled. The cause was not attributed to interrupter failure.

After two years of operation, gas pressure on one interrupter had dropped below the safe operating value of 15 lb, as indicated by a gauge at the bottom of the

Switch 115-Kv Subs

interrupter. This interrupter was replaced and returned to the manufacturer for inspection and check of contact wear from 270 operations.

The Oak Grove Substation capacitor bank was placed in service in June 1957 and operated once a day, six days a week for three months. It was then removed from service because of system reactive conditions. The SF_6 interrupter operated 72 times during this period, and no troubles or difficulties were experienced. This capacitor bank was placed back on automatic control again last May.

When using the SF_6 interrupter for capacitor switching, the only other equipment needed is a 3-pole 115-kv fused switch of suitable interrupting capacity. A 115-kv oil circuit breaker would have required a 115-kv air-break disconnect mounted similarly to the 115-kv fuse switch. Because the fused switch and air-break switch cost practically the same, the comparison of the two switching methods can be based on the difference in cost between the two. At present-day prices, an SF_6 interrupter for a 9,600-kvar bank costs $0.67 per kva as compared with $3.00 per kva for an oil circuit breaker, saving $2.33 per kva or $22,000.

Vacuum Tube Interrupter Also Used

The vacuum tube interrupter is also on trial. The 115-kv unit has four tubes in series, stacked vertically and mounted to fiber-glass rods for mechanical strength, all completely enclosed in a high-strength glass cylinder.

While the interrupter is closed, it carries no current. It is activated only when the air-break switch begins to open, the interrupter then taking full-load current and interrupting the arc. As the air break switch closes, arcing blades make contact first, energizing the capacitor bank and obviating interrupter duty for closing. This feature practically doubles the life of the contacts, which as published is 10,000 operations at 50 amp, 7,500 at 100 amp and 5,000 at 200 amp with a maximum rating of 2,000 amp.

A 115-kv 200-amp vacuum-tube switch, suitable for controlling at least 30,000 kvar, was installed for a 9,600-kvar bank at the 30,000 kw Bastrop Substation bus. The extra capacity provides for future requirements at this substation, which is being enlarged.

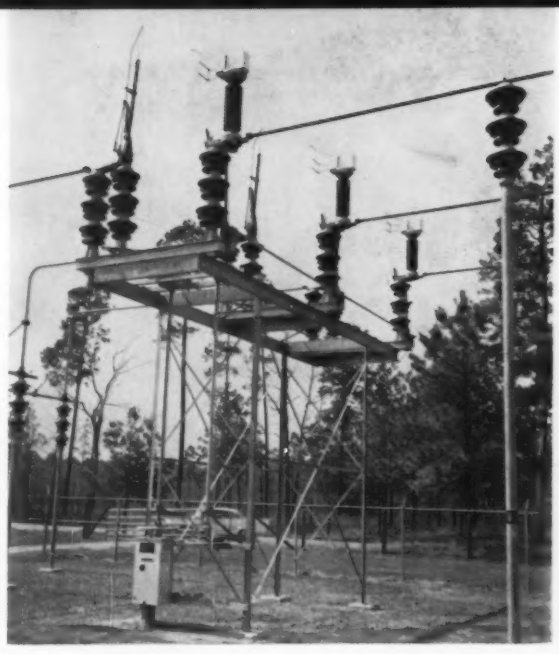
This 9,600-kvar capacitor bank was arranged similarly to the SF_6 installation at Winnfield Substation. Capacitor bank neutral is ungrounded, and a similar phase-voltage balance detector is used.

Since only four vacuum tubes were used in series, the possibility of restrike with an ungrounded neutral is greatly increased. Thus, a neutral grounding switch was incorporated to solidly ground the neutral while the interrupter is de-energizing the bank. The ground switch, controlled by a motor mechanism control circuit, closes automatically before the air-breaker switch begins to open. If the ground switch had not been used, at least two more vacuum switches per phase would have been required, making a total of six additional units and increasing the cost by about $2,000 over the present installation.

The Bastrop Substation vacuum-tube installation was placed in service in September, 1957 on a schedule of six days per week, once a day and has been in continuous operation since that time. No troubles or difficulties have developed during the 276 operations recorded by the counter.

Considering published information on this interrupter, the life expectancy of the switch contacts should be 10,000 operations or 50 yr on this particular application of 9,600 kvar at 115 kv and 50 amp.

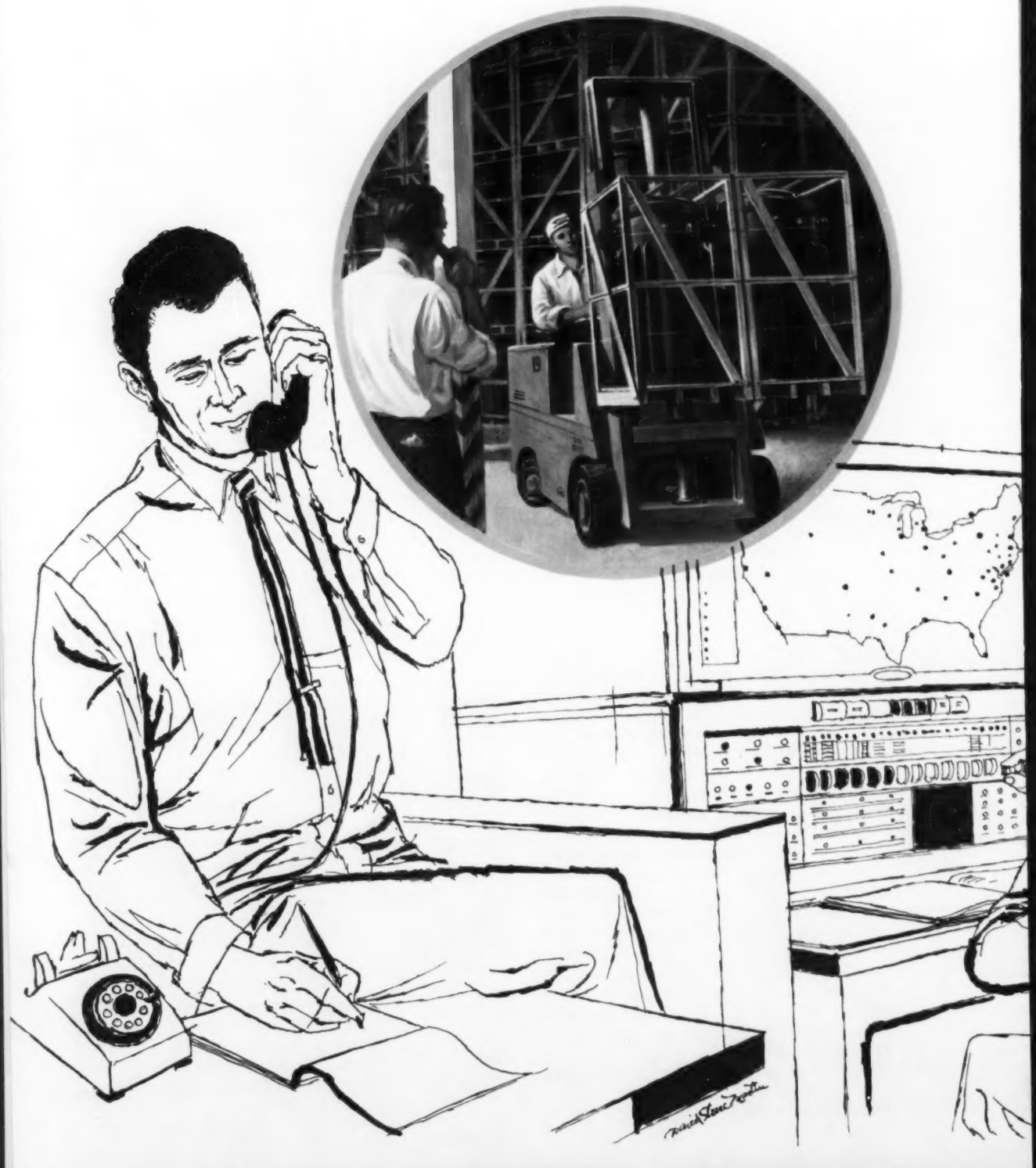
Since the installation of the vacuum tube interrupter is similar to the SF_6, it follows that a comparison can be made between the cost of the vacuum tube unit and an oil circuit breaker. The vacuum tube interrupter installation on the 9,600-kvar bank cost $1.25 per kva as compared to $3.00 for an OCB. In this case the savings were about $1.85 per kva or $18,000.



SF_6 INTERRUPTERS are the most economical means of switching 9,600-kvar banks for Louisiana P&L Co

CAPACITOR POTENTIAL devices and neutral grounding switch are installed at rear of Bastrop bank along with the isolating transformer, which is to the right of the photo

Before you buy another



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Alarm System Calls Attended Phone

PEA Communications group hears device leased from the General Telephone Co has operated eight months

An alarm system which automatically calls an attended station over regular central office lines from an unattended station has been installed by Niagara Mohawk Power Corp, said W. C. Baylis. Lease arrangements with the telephone company under which this device was put in were told to the Communications Committee of Pensylvania Electric Association recently at Philadelphia.

The device is connected to a dial telephone line into Gloversville Substation, said Baylis. Upon indication of an alarm, the device automatically dials an attended number and transmits a recorded message. In 230 tests and two actual calls since Feb. 1, only one failure has been experienced, this due to higher-than-design voltage burning out a vacuum tube. The system rents for $10 per month.

AUTOMATIC DIALING DEVICE for use on regular phone lines will send an alarm from an unattended station

Philadelphia Electric Co's new dispatching center has increased operating efficiency, improved employee morale, and instilled a desire for better housekeeping, said A. C. Hartranft. During the March snowstorm (EW, Mar. 31, p 32), the center operated more smoothly in restoring service with greater efficiency than did the former dispatching facility during storms of lesser degree. The protective relaying network for the 10,854-Mw Pennsylvania-Maryland-New Jersey Interconnection consists mostly of pilot-wire relaying over leased land lines. Where distances or three-terminal lines dictate otherwise, said Hartranft, carrier or microwave channels are used.

Standby battery drain has been cut to 1.82 amp in new transistorized mobile radio equipment for the 25-to-50-mc band, said Fred Dusto, Motorola. The drain can be reduced to 0.4 amp with certain equipment, he said. This can mean annual savings of $75-to-$300 in gasoline used to power the mobile unit on standby. When the unit is transmitting at 50-60 w, the drain is 14-15 amp. For equipment in the 150-mc band, drain on standby is 2.05 amp and can be lowered to 0.4 amp. For a transmitting power of 25 w, the drain is 14.2 amp.

Shock and Burn EEI Accident Prevention Topic

Only the utility company employee "really sold" on safety is a 100% safe worker, 116 safety representatives of companies throughout the country were told at the recent New York meeting of the Edison Electric Institute's Accident Prevention Committee. The speaker was W. C. Bremner, Commonwealth Edison Co.

Company and departmental meetings, literature, posters, various other visual aids, contests, and gimmicks for pricking electrical workers, especially linemen, into awareness of hazards circumstantial to their daily jobs were described by Bremner.

Spurring the committee's activity was the "shocking story" told by the industry's shock-and-burn statistics. Although the frequency of such accidents has been brought to a lower plateau over the past 17 years, their severity rate, according to I. R. Dohr, is still about twice that of industry generally. Dohr, representing Consumers Power Co, was meeting chairman.

Noting the 968 shock fatalities in utility companies over a ten-year period, Tom Hughston, Texas P&L Co, urged that the industry act on the realization that "what it has to sell kills people."

A review of these fatalities, he said, reveals a pattern which should provide a basis for action in reducing them. This pattern, he said, is made up of these consistent elements:

1. A fundamental safety rule was violated.

2. No one was looking on directly when the accident occurred.

3. At the instant of contact, direct supervision was not being exercised.

4. All fatalities were on simple, routine jobs.

5. Little or no planning had preceded the work, the job having been considered so simple that planning was unnecessary.

What emerges from such a pattern, Hughston said, is the fact that in shock fatalities the attitude of the workmen and their supervisor was a principal factor. But the crew's attitude, he said, has been observed to change with a change in the attitude of the supervisor. Change his attitude, he urged, and his crew will achieve a better safety record. Such action, he added, must be extended up to the district manager.

Highlights of the meeting were these:

- Delegates were unanimous on the need for continued training of supervisors in safety.
- Meeting sentiment was strong for an evaluation of mouth-to-mouth resuscitation.
- The delegates' interest was apparent in the possible early develop-

(*Continued on page* 115)

Continuous Reeving Doubles Life of Lines

H. L. BALLARD, Yard Foreman, Kanawha River Plant, Appalachian Power Co, Glasgow, W. Va.

Conversion of a coal-crane reeving system from two to one lines has doubled rope life and saved about $2,250 a year. The new continuous reeving system has operated satisfactorily for more than a year.

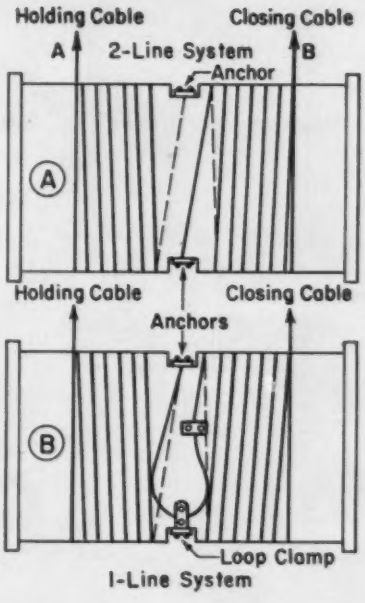
With the two-line system rope was wear was concentrated on the central section of the closing line, resulting in inefficient utilization of about 180 ft at each end. When the worn center section required replacement of the entire line, 360 ft of usable rope had to be discarded. In addition, the holding line had to be replaced periodically.

This system was converted to one-line operation by adding holding clamps to the drum as illustrated. This arrangement permits looping a single line at the center and reeving it through all clamps so that the two ends now serve the purpose of cables A and B in the two-line system.

Now when any section becomes worn, it is merely necessary to loosen the clamps and move the cable to shift the major duty from the worn to the unworn section, thus avoiding replacement of the entire line. This conversion has also eliminated the task of replacing the holding line, as it is now integrated with the closing line.

Comparative figures indicate that continuous reeving has doubled rope life. With the two-line system, 30,000 ft of rope was required to handle 3,913,000 tons of coal, or 130.4 tons per ft of rope. With continuous reeving, 3,560 ft of rope handled 945,000 tons, or 265.3 tons per ft of rope. The conversion cost $283 for material and labor.

This arrangement has been patented by McKiernan-Terry Corp and licensed to American Electric Power Co for use in its system.



ONE-LINE system reduces rope wear, fully utilizing entire length of rope

Store Hot Stick In Special Container

Meter crews of San Antonio Public Service Board use just one hot stick for re-fusing transformers and opening disconnects. To keep the hot stick in first-class condition special steel containers were made and fastened to the steel of the tool and material box of each truck. The container consists of a steel tube of 1½ in. diameter (1¾ in. OD) and 6 ft long with a slotted steel box welded on the end of the tube. The box is 4¾ x 6½ x 1⅞ in.

The hot stick slides easily into the special container and the plastic cap on the bottom of the stick fits snugly in the pipe portion to keep the stick from rattling. The stick hook slides into a slot in the box holding the stick in position in the container. A cover on the box opens and closes easily for convenience in removing the hot stick from or returning it to the container. The cover also protects the stick from weather.

The box end of the container is mounted high on the tool box and at the rear end of the truck. The tube slopes down so that the lower end of the tube is just above the floor of the truck. A drain hole in the end of the tube keeps moisture from accumulating.

HOT STICK IS STORED in special container on truck

From larger General Electric Gas Turbines . . .

MORE PACKAGED POWER

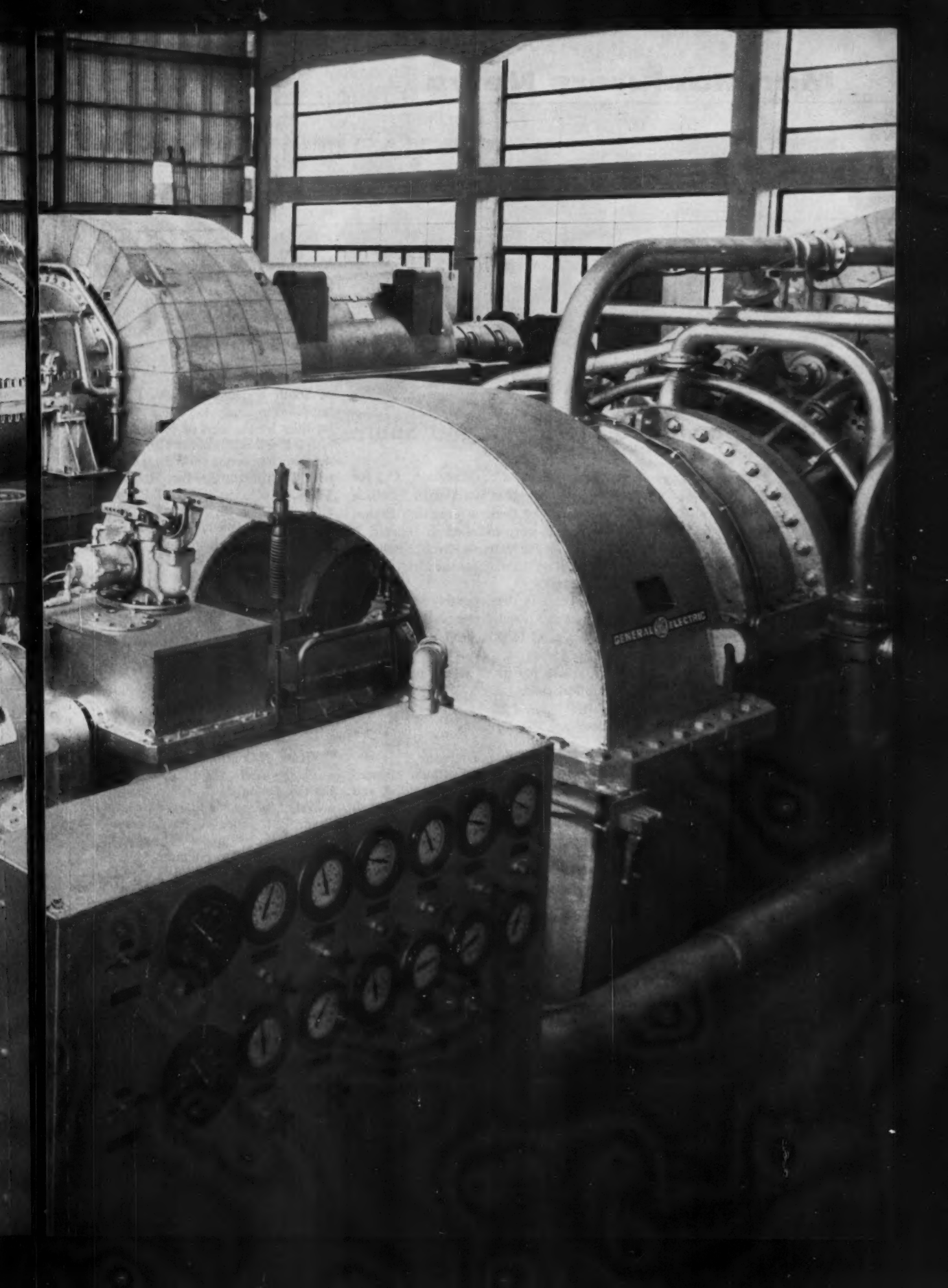
Each of these 16,000-kw General Electric simple-cycle, single-shaft gas turbines has operated more than 6,000 hours since it was installed just over a year ago.

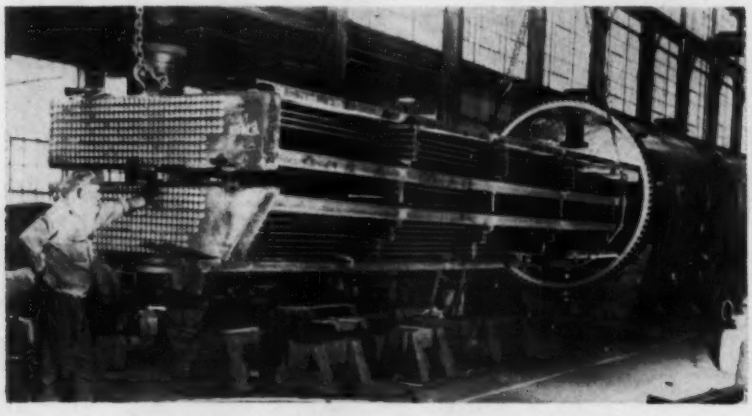
To help lower your power costs, General Electric offers a wide range of self-contained, compact gas turbines from 5,000 to 21,800 kilowatts. Simple- or regenerative-cycle gas turbines are available to suit the economics of the application. Where the easily recoverable exhaust heat can be used for steam generation or in processes, gas turbine cycle efficiencies in excess of 60% can be obtained.

General Electric gas turbines are backed by over two and one-half million operating hours in a wide variety of applications. For more information on the extra values General Electric gas turbines offer your company, contact your nearest General Electric Apparatus Sales office, or write for GED-3546 (Gas Turbines For Industry) or GED-3603 (Gas Turbines For Electric Utilities). General Electric Company Section 261-32, Schenectady, N. Y.

Progress Is Our Most Important Product

GENERAL ELECTRIC


GENERAL ELECTRIC



G-R Evaporators Go to Breed and Sporn

Three evaporators built by Griscom-Russell Co, Massillon, O., for American Electric Power Service Corp exchange heat at about 24.5 million Btu per hr. Griscom-Russell is a subsidiary of General Precision Equipment Corp. Two units like the one shown were installed in Indiana & Michigan Electric Co's new Breed Station on the Wabash River in Sullivan County, Ind. The third will provide condensate makeup for the Philip Sporn Station of Ohio Power Co in West Virginia.

The self-scaling tube bundle design visible in this assembly view, taken in the G-R Massillon plant, is a Griscom-Russell feature and is incorporated in Bentube evaporators. Long 1-in. O.D. Cu-Ni tube bundles are inserted into the front end of the steel shell.

Each unit produces more than 28,000 lb per hr of vapor, net, with a purity of one part per million of dissolved solids.

B-L-H Turbines Start Operations at Big Bend

Total name-plate capacity of California Oregon Power, Medford, Ore., was increased by 20% with the opening of its new Big Bend Project—a $12.5 million hydroelectric power plant located near Klamath Falls, Ore. Two 230-kv lines connect the plant and system.

The new power plant is capable of delivering 80,000 kw. The generators are driven by two hydraulic turbines built by Baldwin-Lima-Hamilton Corp, Eddystone, Pa. Each Francis-type turbine develops 56,000 hp at 277 rpm and 440-ft head. The generators were supplied by the G. E. Co.

In addition to the turbines, Baldwin-Lima-Hamilton supplied two butterfly valves from its Eddystone Division and two Type B governors from its Pelton Division.

The Eddystone hydraulic turbines were built, delivered, installed, and were generating power in less than 22 months from the date they were ordered.

PACECO Ships Reactor Vessel to Waltz Mill

A stainless steel pressure vessel, heart of the Westinghouse Testing Reactor (WTR) has started its journey from the shops of the Pacific Coast Engineering Co, Alameda, Calif., to the reactor site at Waltz Mill, Pa. (EW, Nov. 17, p. 98).

The reactor pressure vessel, designed for 110 psig at 135 F, is 30-ft long with a 7-ft 10-in. diameter and is constructed of 1-in. stainless steel. Its total weight is 84 tons. Head section of the vessel is reportedly the largest stainless steel casting produced. It was poured from a dual melting operation with 34,000 lb of molten stainless steel in two furnaces.

Mergers . . . Planned and Completed

Allis-Chalmers Mfg Co, Milwaukee, disclosed plans to acquire S. Morgan Smith Co, York, Pa., through an exchange of stock of 1.1 share of A-C common for each share of Smith common. Allis-Chalmers hopes to operate the York firm's facilities by the start of 1959.

I-T-E Circuit Breaker Co, Philadelphia, has acquired Wilson Electrical Instrument Co, Inc, Houston, Texas, by offering 8,820 I-T-E common shares for all outstanding Wilson common. Wilson is a manufacturer of distribution panel boards and motor control centers, also sales representative in Texas with annual sales of about $2 million.

Okonite Co stockholders approved a merger on Nov. 24 with Kennecott Copper Corp, through an exchange of stock on a share-for-share basis (EW, Oct. 27, p. 90). The name, Okonite Co, will be continued and the company will operate as a wholly-owned subsidiary of Kennecott.

General Controls Co will purchase the assets of Foster Engineering Co, Union, N. J., subject to approval of the stockholders of General Controls. If approved, formal acquisition will be made February 1, 1959. Foster's production operations will be moved to a new plant at Warwick, R. I. Here, Foster will become a GC division and will be consolidated with the Hammel-Dahl Division. Foster steam, liquid and gas regulating equipment will be sold by GC representatives.

Photoelectric Principle Replaces Computer Brushes

Design engineers of General Electric's Industry Control Dept, Roanoke, Va., announce incorpora-

(*Continued on* page 88)

DEAD END WITH

BLACKBURN

W6-2A from 6 Sol to 2 ACSR

This Clamp Will Handle All Popular Service Drop Wires

WEDGE CLAMPS

For Light Service
W6-4A
6 Sol to 4 ACSR

For Heavy Service
W2-OA
2 Sol to 1/0 ACSR

Conductor in contact with wedge for entire length of slider.

Removable aluminum slider allows installation without threading through clamp.

Drop wire can be pre-sagged and cut to exact length needed.

Can be attached to bare neutral at any point in the span.

Your Choice of 3 Bails

STANDARD | FLEXIBLE CAPTURED | FLEXIBLE FREE

JASPER BLACKBURN CORPORATION

1525 Woodson Rd., St. Louis 14, Mo., WYdown 3-9430.

● They speed up work and provide dependable anchorage in new construction and maintenance. Quick and easy to install—made of tough rust-resistant malleable iron—their holding power "tops" all other. Available two-way, three-way, four-way, and cone types. Write for facts.

AN EXCLUSIVE EVERSTICK FEATURE
Exclusive Everstick nut housing Locks anchor firmly on rod. No chance of rod slipping thru anchor.

EVERSTICK ANCHOR CO
FAIRFIELD, IOWA

Photoelectric Principle

(*Continued from page* 86)

tion of a static photoelectric card reader in the automatic program control system for the company's Computer Dept, Phoenix, Ariz. Contact-making brushes in the card reader have been replaced by the photoelectric principle, to reduce maintenance and downtime.

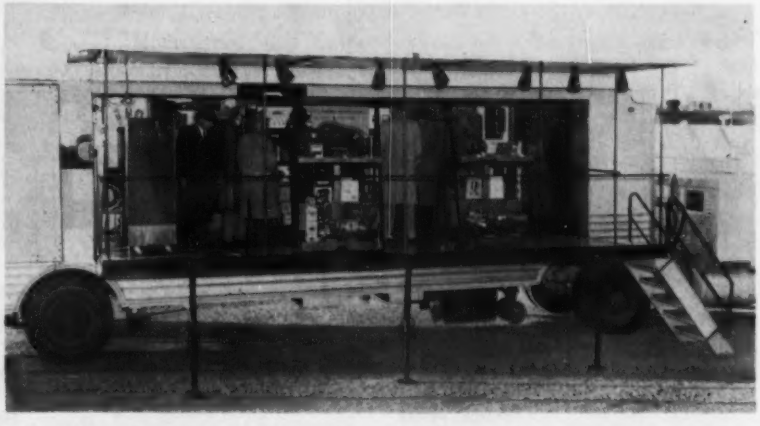
The system, which can be maintained by regular maintenance personnel, is designed to make possible fault isolation within 3 min and replacement of malfunctioning component within 5 min.

Further simplification of maintenance and increased reliability of the system was provided by built-in test circuits. Redundancy and validity tests are built into the system to recognize and indicate an improperly punched card. Reference tests and amplifier tests also provide rapid checks on proper functioning of associated subassemblies, locate defective modules.

Chief Joe Has 60% of Hydro-Generators

Sixteen 64-Mw waterwheel generators built by Westinghouse Electric Corp, East Pittsburgh, Pa., were installed ahead of schedule at Chief Joseph Dam generating station. They are "on the line" and power flows into the transmission system of Bonneville Power Administration.

When eleven other units of the same capacity are installed, the generators at the dam will have a combined output of 1,728 Mw.



Reliance R-Cade Starts 18-Mo. Tour

A mobile display of electric drives, products of Reliance Electric & Engineering Co, Cleveland, has started on an 18-month tour of the United States. It is scheduled to cover about 50,000 miles.

Called the Reliance R-Cade, this traveling unit will visit plants to show the manufacturer's various products to engineers, business men, purchasing agents, and production supervisors. Displayed will be ac and dc motors, variable voltage drives, mechanical variable-speed drive systems, gearmotors, motor control units, and a demonstration of process control. As the tour progresses, the products displayed will be changed to suit the regional industry, for example, in the Southeast, textile equipment will be emphasized; and in Tulsa, petroleum.

After the 8x32-ft trailer is parked, a hydraulic system is operated. One side of the trailer drops to form a 6x22-ft stage and a section under the roof slides out to become a canopy for the stage. All working displays and lighting are powered by a 50-kw engine-generator set on the tractor. This generator also supplies power for a heating and air conditioning unit mounted under the trailer.

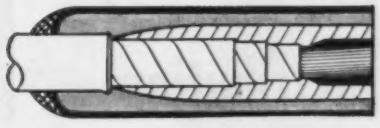
Present itinerary of the R-Cade includes December visits in Salt Lake City, Idaho Falls, Lewiston, Spokane, and Seattle. After the holidays, the unit will head for San Francisco, Los Angeles, and Denver; then to the Tulsa Oil Show in May, 1959.

THE RIGHT CABLE JOINT FOR YOU

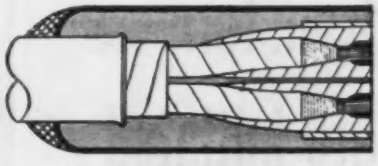
PRE-ENGINEERED

FOR LOW COST AND HIGH QUALITY

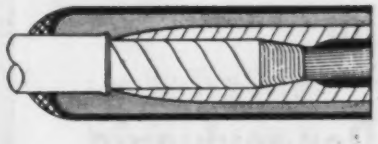
The joint design you need is most likely among the thousands of up-to-date pre-engineered designs in G&W files. They represent a thorough knowledge of the requirements of allied equipment used in power distribution.



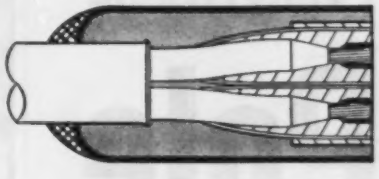
The result at G&W is a keen appreciation for the need of designing cable joints and supplying materials that are best suited to a particular type of cable.



We can select the design you need in minutes. You save expensive time for engineering and ordering. G&W pre-engineering is complete to the last detail. Specifications, drawings and instructions cover the materials and the proper procedure for preparing a joint. They include each step from removing the sheath to making the splice and applying, when necessary, the protective cover or casing. This data is enclosed in the convenient unit package of materials you receive to make each joint.



Only the best quality materials are supplied by G&W. Overages are estimated to make reasonable allowances for variations of individual handling by splicers.



Do the job right the first time. Order G&W pre-engineered cable joints. Call a G&W representative for full details or write us for Bulletin JA56.

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3500 WEST 127TH STREET • BLUE ISLAND, ILLINOIS
CANADIAN MFR. • POWERLITE DEVICES, LTD. • TORONTO, MONTREAL & VANCOUVER

JS21

Many improvements in distribution transformers are initiated by Pennsylvania

Pole Star transformers

Test Programs and Committee Work Further Industry-wide Progress

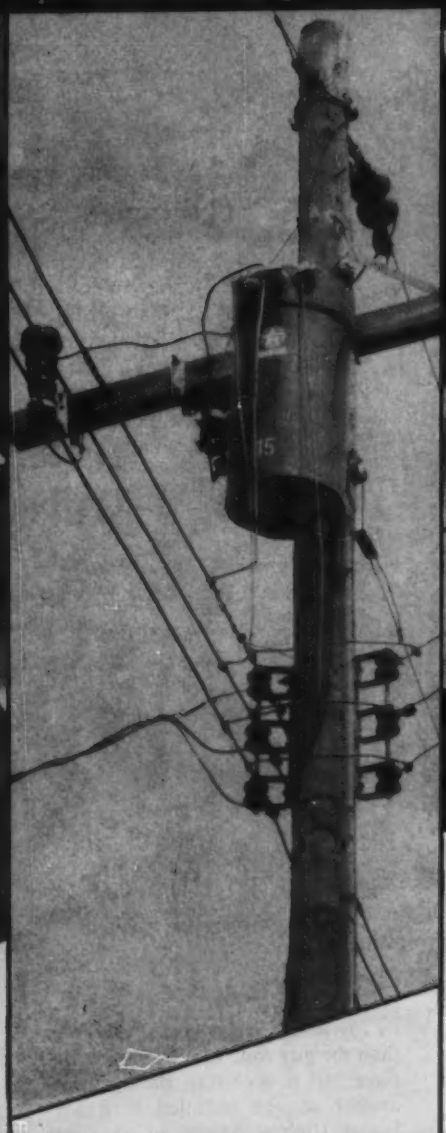
Since the inception of an AIEE program in 1956, Pennsylvania Transformer Division has been actively participating in a series of insulation life tests. By contributing time, facilities and personnel, and by taking part in other committee activities and projects of AIEE, EEI and NEMA, Pennsylvania is helping to provide the entire electrical industry with valuable information and guidance.

Pole Star's Stud-type Sidewall Bushings Eliminated Pockets

When the Pole Star was introduced more than eleven years ago, Pennsylvania pioneered the use of streamlined, leak-proof, stud-type bushings. Such innovations —when improved materials and techniques make them feasible— are typical of Pole Star leadership.

High-Strength Insulation System Gives Pole Stars Greater Life Expectancy

Introduced almost without fanfare more than four years ago, the Pole Star insulation system has been proved equal to or better than all other systems from the all-important standpoints of insulation strength and life expectancy. The system consists largely of pre-treated insulating materials that include corrugated spacers and specially processed kraft paper that possesses exceptionally high electrical and mechanical strength at higher-than-normal operating temperatures.



First Completely Sealed Distribution Transformers Now in Actual Service

The "Perfect Seal" Pole Star—a completely sealed distribution transformer—appears to be the transformer-of-the-future as a result of present trends toward the elimination of taps in many voltage classes. Working with various electrical utilities throughout the United States, Pennsylvania has distributed a number of completely sealed distribution transformers for "in service" observation and testing.

Lap-on-Top Core One of Four Basic Distribution Cores

The patented lap-on-top Pole Star core is one of but four basic distribution cores being used today. Designed to take full advantage of the inherent characteristics of cold-rolled, grain-oriented silicon steel, it is notable for its low exciting current, low core loss and consistently high quality.

McGRAW EDISON

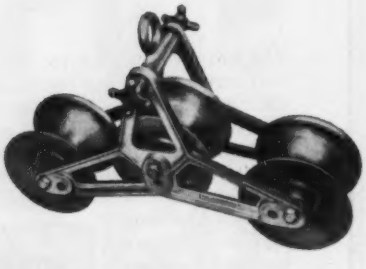
Pennsylvania Transformer Division

McGraw-Edison Company
CANONSBURG, PENNA.
Greater Pittsburgh District

New Equipment

Transformers . . .

. . . for underground systems are pad mounted. They enable utilities to achieve esthetically appealing self-contained transformer installations that blend conveniently with a residential, commercial, or industrial area. The transformers are available in single-phase units rated 25, 37.5, 50, 75, 100, and 167 kva, 2,400/4,160Y through 7,200/12,-470Y-v, or in 3-phase units rated 75, 112.5, 150, 225, 300, and 500 kva, 2,400 through 12,000 v.
Line Material Industries, McGraw-Edison Co, Milwaukee 1, Wisc.

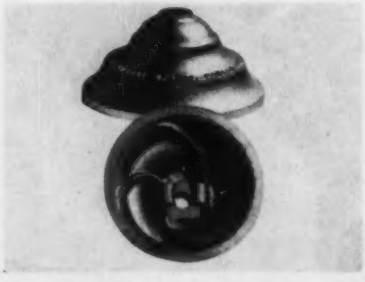


Cable Guide . . .

. . . features three aluminum sheaves mounted in an aluminum frame. It is adjustable to different radii, and virtually any size cable and installing any degree of turn is simplified. The pulling rig is suitable for installation of neoprene jacketed, as well as armored and other semi-rigid, cable.
T. J. Cope Div, Rome Cable Corp, Collegeville, Pa.

Repeater Station . . .

. . . for land-mobile communications systems allows cross-over of frequency bands. Both the communications channel and relay channel circuitry are housed in a single cabinet. It is designed to operate in both directions with any combination of two of the three frequency bands assigned to land-mobile communications by the FCC. These frequency bands are 25-54 mc, 144-174 mc, and 450-470 mc.
Allen B. Dumont Labaratories, Inc, 750 Bloomfield Ave, Clifton, N. J.

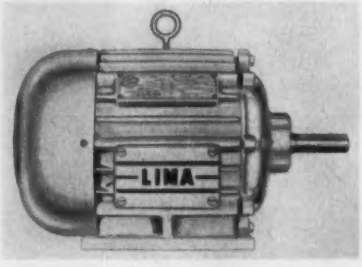


Guy Anchor . . .

. . . is designed for strength greater than the guy rod. Made from a one-piece cast iron casting, the MURCO anchor can be installed in a hole bored slightly larger in diameter than the cone and about 6 ft deep. It is made in three sizes to accomodate guy rods of ⅝, ¾, and 1 in. in diameter. Shipping weights are about 6¾, 14¼, and 29 lb respectively.
D. J. Murray Mfg Co, Wausau, Wisc.

Motors . . .

. . . are Underwriters' Laboratories approved for Class I Group D and Class II Group F and G explosion-proof service. They are supplied in NEMA Standard Frames, No. 182 through 326U, accomodating standard ratings of 1 through 40 hp, either 3 or 2-phase, in all commercial frequencies and voltages below 600. Known as Type EX, the



motors are approved for use in locations where hazardous gasoline, naptha, alcohol, acetone, and lacquer solvent vapors and natural gas are present.
Lima Electric Motor Co, Inc, Dept 75, Lima, Ohio

Fusible Switches . . .

. . . of the QMQB (quick-make quick-break) type are available in a range from 30 through 600 amp, 250 and 600 v. The switches have visible blades for maximum safety.

High-pressure fuse holders and deionizing arc quenchers are other features.
Federal Pacific Electric Co, 50 Paris St, Newark, N. J.

Brushless Generator . . .

. . . line does not have commutator, slip rings, or commutator or slip ring brushes. Generators use an a-c exciter which furnishes current to the rotating rectifier assembly. The line is available in ratings from 6.25

(*Continued on page* 98)

Lower Battery Drain—No need now for heavy duty batteries and generators. Current drain on "stand-by" is 1/3 that of tube-type receivers, 1/15 with battery saver switch.

Greater Reliability—Transistors, printed circuits and new design all greatly increase reliability.

Smaller, Lighter—Approximately 1/2 the weight, 1/3 the size of other models. Mounting in tight quarters easier than ever.

Completely transistorized receiver and power supply... Another Motorola First!

Here is 2-way radio with efficiency and reliability never before approached in mobile radio. No more tubes in the receiver —no more vibrators in the power supply . . . all are replaced by long life, dependable transistors. No longer is it necessary to idle the vehicle to keep the radio operating. Savings in gasoline, engine wear and batteries add up fast. Let us prove to you how MOTRAC radio will cut your radio operating costs . . . while giving you reliability never before possible. Write today.

MOTOROLA 2-WAY RADIO

Motorola Communications & Electronics, Inc., 4501 Augusta Blvd., Chicago 51, Ill. • A Subsidiary of Motorola Inc.

MOTRAC is a trademark of Motorola Inc.

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T. J. Cope.....Cable Guide ☐
Dumont .....Repeater Station ☐
D. J. Murray .....Anchor ☐
Electric Machinery .....Motors ☐
Holophane .....Luminaire ☐
Int Register .....Time Switch ☐

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New York 36, N.Y.

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December 8, 1958

99.6% SURE

Of all manufacturers of power capacitors only C-D puts each and every unit through a full voltage energization test before shipment to you. This is why C-D delivers an unbeatable 99.6%-sure performance

PERFORMANCE

in the field.

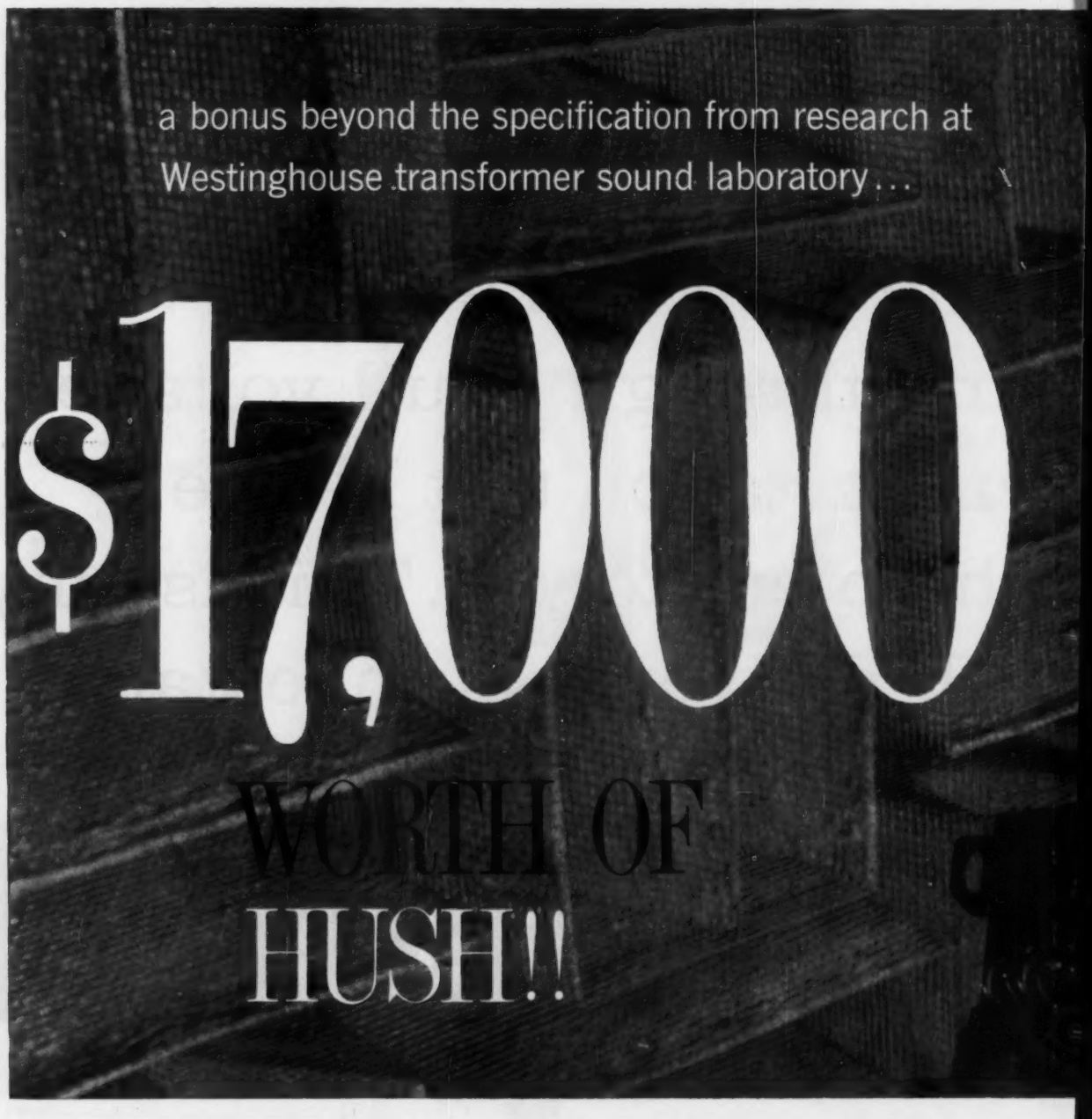
15, 25, 33.3, 50 and 100 KVAR capacitors for every application with lowest dielectric unit stress and highest major insulation level. Invest your purchasing dollar in internal quality—the only place where it counts. See your C-D representative or write Cornell-Dubilier Electric Corp., Dept. EW-12, South Plainfield, N. J.

SPECIFY

Consistently *Dependable*

CORNELL-DUBILIER

POWER-FACTOR CAPACITORS



New reduced sound levels for Westinghouse power transformers eliminate price premiums for many installations

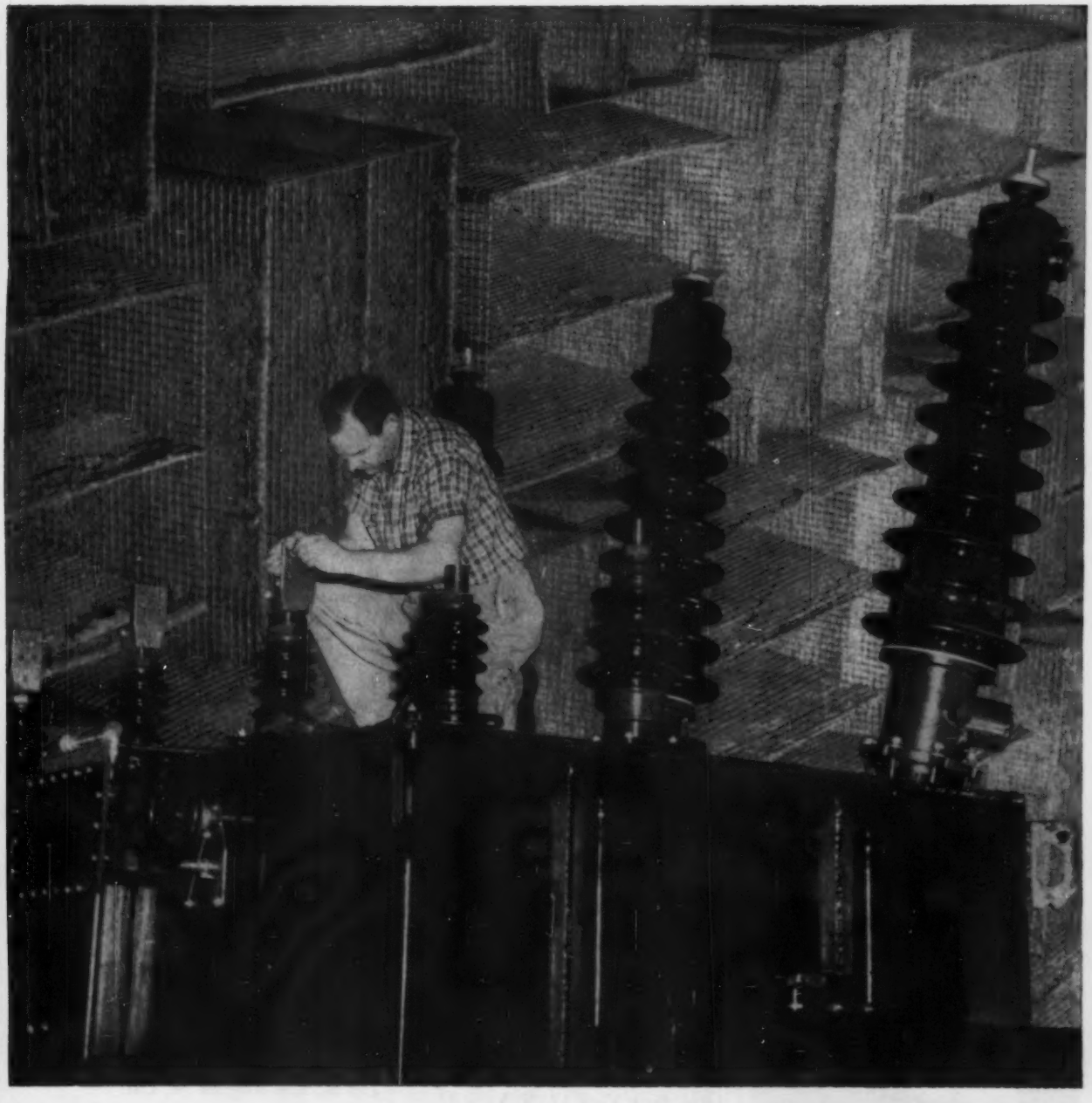
Announcing reductions of power transformer sound levels from one to nine decibels below NEMA levels, Westinghouse has again demonstrated its leadership in transformer development.

This means price premiums are eliminated for transformers built to these below-NEMA sound levels—saves up to $17,000 on original transformer cost (for a 400-mva FOA transformer).

These savings were made possible through earnings plowed back into research . . . for studying and developing better means of reducing sound levels at the source—better design, new and improved methods and materials.

The major Westinghouse facility for researching sound is the vast anechoic chamber at Sharon. This laboratory—together with other high-power test equipment in Sharon's test center—permitted Westinghouse engineers to investigate sound control thoroughly . . . to evaluate sound dampeners . . . to evaluate barriers and complete enclosures . . . and to evaluate their efforts for reducing noise at its source, the transformer core.

From these test facilities came new reduced sound



levels—the result of improved materials and processing—modifications to steel formulations, handling techniques and core building combinations. The effect of each change was isolated in the sound lab, and its value thoroughly proved.

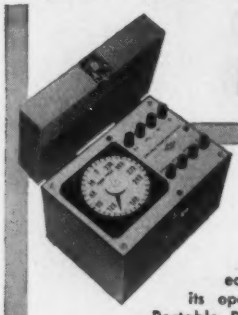
Shown here are typical examples of potential savings in transformer cost through the new reduced sound levels. Ask your Westinghouse representative about savings for your specific transformer application . . . another example of the real benefits produced through Westinghouse research—from earnings reinvested in the study of electric utility industry problems. J-70811

Typical Transformer Example	Recommended NEMA Sound Level in db	Westinghouse Sound Level in db	Reduction Guaranteed Sound Level in db	Percent Saving in Original Equipment Cost	Potential Dollar Saving on Original Cost
5000 kva Type OA 350 kv BIL or lower	67	65	2	12%	$ 3,800
10,000/12,500 kva Type OA/FA 350 kv BIL or lower	74	70	4	12%	$ 6,600
30/40/50 mva Type OA/FO/FOA 550 kv BIL	82	78	4	2%	$ 3,300
400 mva Type FOA 900 kv BIL	96	89	7	2%	$17,800

YOU CAN BE SURE...IF IT'S Westinghouse

WATCH "WESTINGHOUSE LUCILLE BALL DESI ARNAZ SHOWS" CBS TV MONDAYS

PORTABLE PHASE ANGLE METER



Completely self-contained, and requiring no auxiliary equipment for its operation, this Portable Phase Angle Meter offers a direct way of checking relay and instrument connections, particularly directional over-current relays, differential relays or similar equipment. It may also be used to measure the prevailing power factor in each phase of a polyphase watthour meter installation. The device has a frequency of 60 cycle, with voltage ranges of 60, 120 and 240 volt. Current ranges are 1, 2.5 and 5 amp. . . . DIMENSIONS: 9½ x 6¾ x 5⅝ inches. Weight 19 pounds.

Also available in other voltage combinations

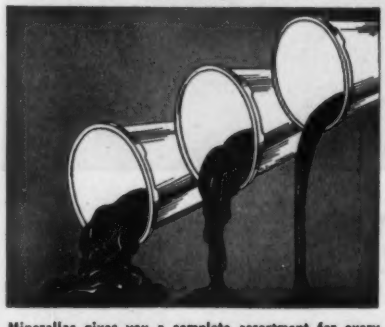
Write for Bulletin 875 for complete information

EASTERN SPECIALTY CO.
PHILADELPHIA 40 PA.

Insulating and Cable-Pulling

COMPOUNDS

of Record-Breaking Performance



Minerallac gives you a complete assortment for every need: dense, viscous and fluid consistencies for high and low voltages in cable-joints, pot-heads, terminal bells, distribution cables, street lighting, telephone work . . . Insoluble in oil or water, for all temperatures. Clean, safe, economical—outranks all others in quality.

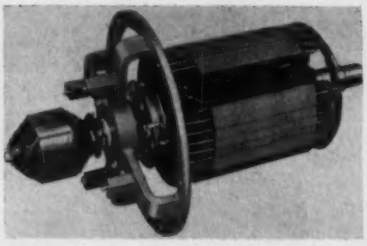
Send for new literature and prices.

MINERALLAC ELECTRIC COMPANY
25 North Peoria Street—Chicago 7, Illinois

MINERALLAC

Brushless Generator

(*Continued from page 92*)



through 187kva and speeds of 1,200 and 1,800 rpm. Because of reduced maintenance, the generators are suitable for dusty or abrasive atmospheres.

Electric Machinery Mfg Co, Minneapolis 13, Minn.

Luminaire . . .

. . . has one-piece prismatic refractor made of thermal shock-resisting glass for a light controlling element. Known as No. 440, the luminaire is designed for use with 400 w mercury vapor or 500 w incandescent lamps. A stainless steel spring hinge supports glass member. It can be installed on cast aluminum bracket No. 0877 or standard pole bracket arm.

Holophane Co, Inc, 342 Madison Ave, New York 17, N. Y.

Time Switches . . .

. . . are designed for high amperage loads. Known as the Intermatic "Fifty-Five" Series T500-R time switches, they are recommended for controlling window lighting, neon signs, poster panels, and night lighting of used car lots, factories, parking lots and garages. Available in 125 or 250 v models, the switches are rated 55 amp per pole. They will handle up to 27,500 w of incandescent lamp loads, or motor loads up to 2 hp. Up to 12 on-off operations per day can be obtained by use of easily attached trippers.

International Register Co, 2620 W Washington Blvd, Chicago 6, Ill.

More New Products

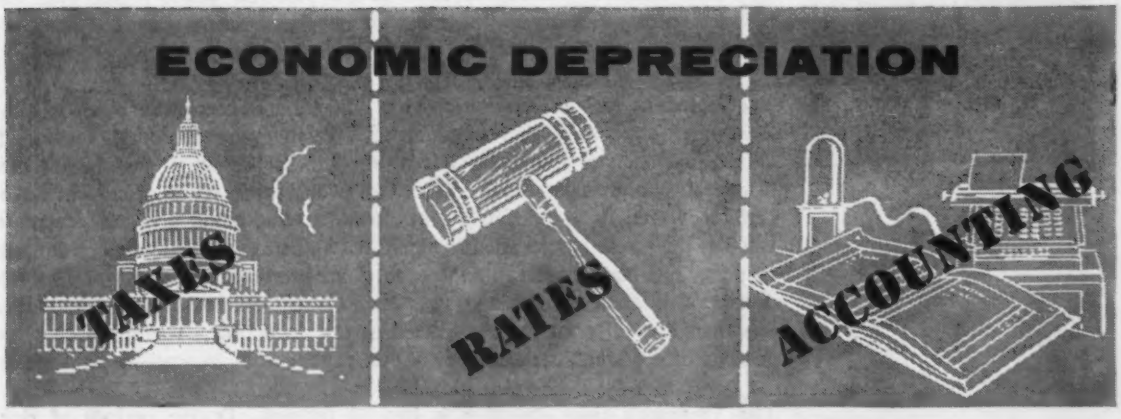
High-penetrating **wetting agent** is employed to arrest dust in coal and aggregate handling operations. Called Formula No. 117, it is designed for efficient dust control when diluted 1,000 times with water.—Circle Chemical Co, 333 N Michigan Ave, Chicago 1, Ill.

Self-adhering **utility markers** are available in numbers and letters and almost all kva ratings. The reflective markers identify transformers, switches, control panels, fire equipment, etc.—Westline Products Div, Western Lithographing Co, 600 E 2nd St, Los Angeles 54, Cal.

Emergency lighting unit operates from 115-v circuit or 7½-v battery. Unit switches automatically to battery when power source fails. With plug removed, unit may be used as hand lamp.—Electric Cord Co, 21 Spruce St, New York 38, N. Y.

Circular slide rule has 16 scales with an average scale length of 17 in. Called the Dial-O-Matic, the Log Log Hyperbolic slide rule features a special process of cursor-rotor-stator cooperation.—The Eckel Co, 31 St. Joseph St, Arcadia, Cal.

(This is the last of three articles on economic depreciation)



In Washington . . . **In the Commissions . . .** **In the Utilities . . .**

What Are ED's Chances?

Finance

Adoption of economic depreciation in the utility industry depends on three separate, but interlocking decisions. One must be made by the government in Washington; one by the individual regulatory commissions; and one by the utility itself. The U. S. Treasury or the Congress will decide whether to allow economic depreciation as a deduction from the federal income tax. The state public utilities commissions will have the say as to whether or not it will be allowed for rate-making. The utilities must decide whether or not to adopt economic depreciation in their own accounting.

Economic depreciation differs from the traditional method principally in that it recognizes changes in the purchasing power of the dollar. The purpose of depreciation is to recover the value of capital invested in property by charging it off during the useful life of the property. The traditional way of doing this is to write off the original cost of the property in equal installments over its useful life. Thus the number of dollars originally invested is recovered.

Proponents of economic depreciation feel, however, that the traditional method only works when the dollar is reasonably stable. If the dollar is steadily losing its purchasing power, they feel that traditional depreciation simply does not recover the value of the capital originally invested. Their remedy is to tie depreciation in some way to the dollar's current value. Two previous Management Newsletters have discussed means of doing this (EW, Sept. 1, 1958, p 71; and Oct. 20, 1958, p 127).

This article turns to the practical realities of economic depreciation, as distinct from its theory. Will it be adopted? What are its chances of recognition by the government as an income tax deduction? How does it stand before the

regulatory commissions? Are utilities likely to adopt it for their own accounting? Answers to these questions depend to some extent on each other, but the key probably lies in Washington.

A Rough Road in Washington

Biggest obstacle to economic depreciation is the reluctance of the federal government to allow it as an income tax deduction. Proponents of economic depreciation have been to Washington often in the past few years, laying their case before Treasury officials and members of Congress. So far, they have met with little success. And the immediate outlook is no brighter.

The argument for tax recognition runs like this: Depreciation is an expense, like wages, operation and maintenance. Every year in recent history the decreasing value of the dollar has resulted in higher wages and higher costs of operation and maintenance. These are evaluated in terms of current dollars and recognized as tax deductible expenses. At the same time, the decreased value of the dollar has resulted in higher costs due to the economic consumption of plant and equipment. But these costs are evaluated in terms of historical dollars of different purchasing power from current dollars, so that substantially less than the full costs are recognized as tax deductible. The result, say proponents of economic depreciation, is that capital—not income—is being taxed.

The Treasury's chief objection is loss of revenue. During periods of rising prices, allowances for depreciation would be larger and tax revenues smaller for a given level of business activity. The rebuttal is that the economy would grow more rapidly under a tax system that would protect capital against inflation, but Treasury officials remain hard to convince. They note that this is the standard argument brought up in favor of almost every proposal of tax reform, and stare at the direct loss of revenue.

There's also a theoretical objection raised by some economists and officials. Capital, they point out, can take many forms: Cash, bonds, paid-up insurance policies, and common stocks as well as machinery. If one form of capital—that invested in productive goods—is going to be protected against the ravages of inflation, then how can politicians deny the same protection to every other form of capital? If this came about, government bonds might carry a built-in inflation factor, insurance companies might be required to pay off in dollars adjusted to inflation over the life of the contract, and so forth. This, they say, would quickly become a broad underwriting of inflation by the federal government, and would itself tend to force additional inflation.

A third objection is political. Even the modest liberalization of depreciation allowances approved in the Internal Revenue Act of 1954 has been attacked by many Democrats as a "give-away" or a loophole through which corporations avoid their "proper share" of taxation. This makes it difficult for lawmakers of either party to vote any increase in depreciation allowances—justified or not—without at least a corresponding reduction in personal income tax rates. Thus the impact of an economic depreciation formula is hardly ever judged in political circles on its merits alone. Many practical politicians insist if it is ever adopted, it will have to wait for a period of broad, general tax reduction. And in the heavily-Democratic Congress of the next two years, any tax reform ideas that get serious consideration are more likely to aid lower-income taxpayers than business.

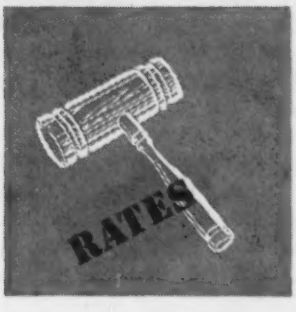
One bill favoring economic depreciation will be introduced in the next session of Congress, however. This is the Keogh Bill, sponsored by Rep. Eugene J. Keogh (D.-N. Y.). As first introduced in the 85th Congress July 3, the Keogh Bill aims to amend the Internal Revenue Code of 1954 by allowing a "reinvest-

ment depreciation deduction, with respect to the amount invested by the taxpayer in the purchase or construction of eligible business assets, the amount by which the reinvested amount exceeds . . . eligible business assets sold, abandoned, or dismantled during the taxable year."

The key word in the Keogh Bill is "reinvested." The bill ties the tax deduction to the inflationary price levels actually existing when the old property is retired and replaced by new. The deduction would be allowed in the year of retirement and replacement, its amount being generally equal to the excess of the cost of buying new property over the original cost of the property retired. In this respect it resembles the deferral of taxes on profit from the sale of a home, provided the home owner replaces it with a new home within a given time.

Because the Keogh Bill "drags" replacement into the picture, some argue that it falls short of theoretical perfection as an economic depreciation measure. If economic depreciation is sound, and the value of invested capital should be recovered, then the tax deduction should be allowed whether or not the retired property is replaced. Also it should be deductible as it is written off the books from year to year. However, the Keogh Bill drew support in hearings last summer before the House Ways and Means Committee, from associations representing such industries as railroads, pulp and paper, coal, cement, and steel—perhaps partly on the thesis that half a loaf is better than no bread.

Despite this support, the Keogh Bill died last session in the Ways and Means Committee. It will be reintroduced in the new Congress, according to its sponsor, but it unquestionably faces a rough road through the heavily Democratic 86th.



Can the Commissions Be Convinced?

Utilities have another important practical problem regarding economic depreciation that does not affect non-regulated industry. Like other industries, utilities need to recover half the additional economic depreciation charges by tax deductions in order to avoid a great reduction in earnings. But unlike other industries, utilities need to go before their regulatory commissions before they can recover the other half.

How has economic depreciation fared before the commissions? So far, only a handful have ruled on it, and only one of these has come out clearly for economic depreciation in its decision. In January of 1957, the Public Service Commission of Indiana awarded a rate increase to the Indiana Telephone Corp. In unanimously deciding to recognize the loss in purchasing power of the dollar in accruing annual depreciation charges, the commission stated:

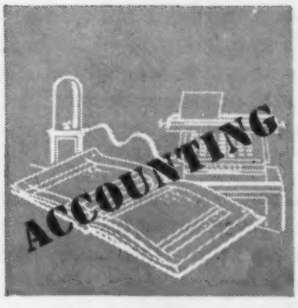
"Depreciation is as much a cost of doing business as wages and salaries and other obvious operating expenses; depreciation is the cost of plant or property consumed from day to day in the production of services sold by a utility. Depreciation, or the cost of plant consumed, measured in current dollars, and related to other factors as was done in the evidence presented herein tends to reflect a realistic picture of profits in which there is no understatement of cost or overstatement of profits."

The Supreme Court of Texas also recognized economic depreciation in the "Alvin Case", decided on appeal in April, 1956. Said the court: "The item of depreciation of a given piece of property appearing in current expenses for rate purposes should be closely correlated with the "fair value" appraisal of the same piece of property from year to year, and the whole should be consistent."

Not many utilities have presented the case for economic depreciation to their state commissions, but the Committee on Rates of the National Association of

Railroad and Public Utilities Commissioners noted in its report given last month at the NARUC convention in Phoenix, Ariz., that ". . . economic depreciation has continued to receive substantial attention in the literature on rate making". The committee went on to say: "The apparent concern with respect to the subject indicates that the matter will be an issue in more rate cases in the future as more inflation accentuates the problem."

The tax problem carries over into the rate picture. It is hard to get approval of economic depreciation from commissions as long as it is necessary to charge the rate payer $2 for every $1 of cost incurred. And this will be the case until the tax laws are changed. Without federal tax recognition, half of the added revenue collected to cover the cost of economic depreciation must be turned over to the government as income tax. This has been a stumbling block in the path of rate recognition, and will probably continue to be.



Companies Won't 'Go It Alone'

Utilities are not likely to adopt economic depreciation on their own books without first obtaining support from the Treasury and the commissions. Accountants are divided on whether or not economic depreciation is a good idea, and even its staunchest advocates feel that its adoption only on a company's books without the tax deduction and rate recognition to go with it would be impractical.

If a company should adopt economic depreciation on its books alone, the immediate effect would be to reduce reported earnings substantially. What effect would this have on the company's securities? The actual financial status of the company would not have been changed by the correction in bookkeeping, since the economic depreciation is taking place anyway—whether or not it is reflected in the income statement. But to assume that the accounting change would have no effect on prices of securities is probably expecting too much of the investor.

One security analyst expressed grave doubt that a utility could get away with adopting economic depreciation for accounting purposes without a decline in the price of its stock. His impression was that the average investor looks "only at the bottom line" of the income statement when pricing a stock—and does not go into such details as the method by which the company has computed its depreciation charge.

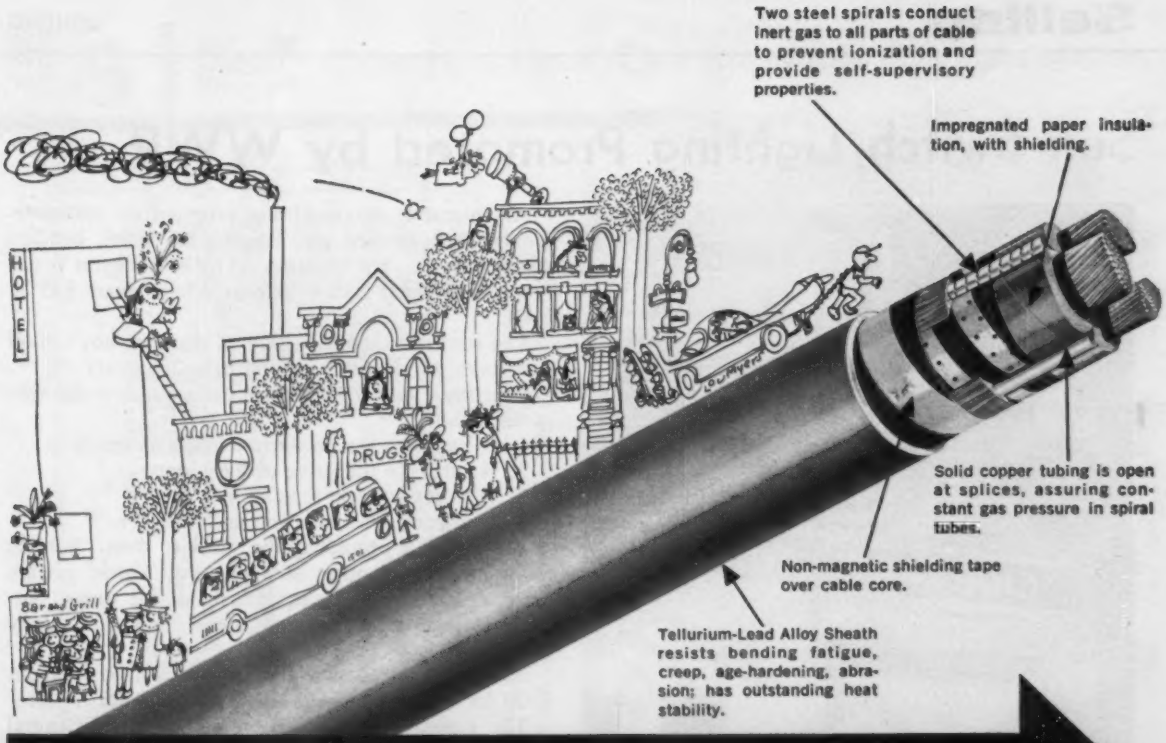
Another analyst shared this view. "If a utility adopted economic depreciation on its books now," he said, "there would be a reaction on the price of the utility's stock. It's not proper, but there would be a reaction.

"We're kidding ourselves by not adopting economic depreciation," he continued. "It's necessary, and it should be done—but it should be accompanied by recognition for tax and rate-making purposes."

• • •

With the present bleak outlook for tax recognition, proponents of economic depreciation expect no break-through in the immediate future. But they are encouraged by signs that economic depreciation is becoming more widely understood. They point out that it took a group of enthusiasts ten years to sell the Last-In-First-Out inventory accounting concept to the Internal Revenue Service, but provision for LIFO accounting is now a part of our tax structure.

Economic depreciation is still in the discussion stage, for the most part. But proponents feel that support for the concept is growing, and it is likely that more will be heard of economic depreciation in the future.


Two steel spirals conduct inert gas to all parts of cable to prevent ionization and provide self-supervisory properties.
Impregnated paper insulation, with shielding.
Solid copper tubing is open at splices, assuring constant gas pressure in spiral tubes.
Non-magnetic shielding tape over cable core.
Tellurium-Lead Alloy Sheath resists bending fatigue, creep, age-hardening, abrasion; has outstanding heat stability.
HOTEL
DRUG
Bar and Grill

KEEPS UPHILL POWER "ON THE LEVEL"!

ROEBLING
GAS-FILLED CABLE

What happens when solid-type cable is used on steep grades? If you've used it, you know! The oil impregnant simply obeys the law of gravity and drains to the bottom of the grade. At the low point, hoop stress (caused by oil pressure build-up) makes the lead sheath stretch. Eventually a rupture occurs. And in the areas drained of oil, ionization takes place.

What's the answer to this constant (and inevitable) problem? *Roebling Low-Pressure Gas-Filled Cable*—for voltages up to 46 kv! Dry nitrogen gas, inside this cable at approximately 12 psi pressure, provides consistent dielectric properties throughout the length of the cable. No matter how steep the grade, internal pressure is uniform everywhere.

Another feature of this cable is that it is self-supervisory—an alarm system lets you know if there's trouble along the line.

Roebling Low-Pressure Gas-Filled Cable is as easy to splice as solid-type paper power cable. It offers the least expensive long-term answer to the problem of transmitting power uphill! Get the whole story from your Roebling Field Representative soon. Electrical Wire Division, John A. Roebling's Sons Corporation, Trenton 2, New Jersey.

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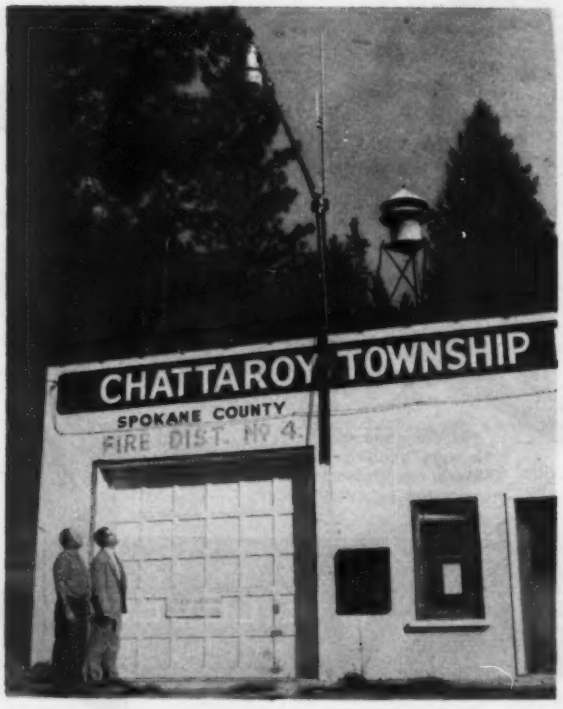
Branch Offices in Principal Cities • Subsidiary of The Colorado Fuel and Iron Corporation

Sun Switch Lighting Promoted by WWP



An intensive merchandising program on automatic sun-switch controlled area lighting for farms, handled through dealers, has been started by Washington Water Power Co. Each 295-w bulb is worth about $15 in EAR.

The goal is to sign up 10% of the company's rural customers, about 1,000, in the next 2½ years.

Four basic selling points will be stressed on the sun-switch lighting:

1. It lengthens the productive hours on the farm.
2. It enhances the value of the property.
3. It promotes night time safety.
4. It discourages vandalism and burglary.

WWP is also promoting the "dusk to dawn" lighting for a number of other outdoor uses: Yards, private lanes, recreation areas, equipment service areas, outdoor storage sites, parking areas, and community centers.

A typical installation (see photo) will cost about $100 for wiring, unit and labor, plus $20 for a pole.

The fixtures are made by Line Material, General Electric and Westinghouse, and the companies are contacting their dealers to get them to stock the fixtures. This effort is being coordinated through the farm committee of the Inland Electrical League. The committee is chairmanned by Don Jordin, Washington Water Power farm sales supervisor.

New GE Facility Helps to Prove Good Office Lighting Pays

The General Electric Co has added an office lighting facility to its Lighting Institute at Nela Park, Cleveland, Ohio, to help prove that office lighting stimulates efficiency so that it pays for itself and earns a profit.

The new facility introduces several advances in lighting. They include:

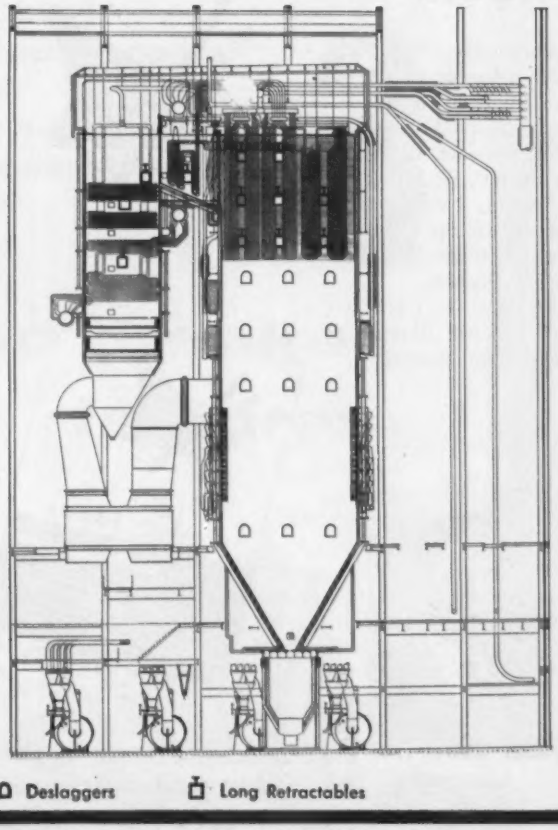
- Comfortable lighting levels up to nearly 1000 ft-c.
- A new system of ventilating the lighting system which will virtually cut in half its load on the air-conditioning system, and materially reduce heating requirements for the space.

Techniques help create a "private" office within a larger office facility as shown in the photo. The floating luminous panel which forms its ceiling can be lowered to different heights, to provide shadowless large-area luminous element lighting.

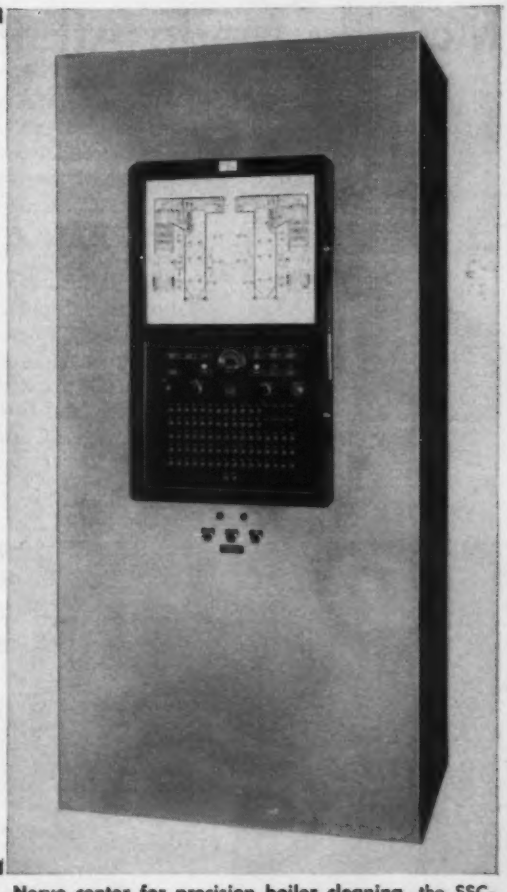
Important tools of the center include display boards showing how much offices cost for salaries, furniture, space, etc., and how much money better lighting will save; and the progress made in the desire for greater footcandles from the pre-1930 area to the next 10 years and beyond.

GE plans to use its new space to demonstrate frontiers of lighting development to its more than 25,000 yearly visitors, and as a laboratory for study of advanced designs for lighting and its environmental control systems.

How Copes-Vulcan control systems boost power plant efficiency



Showcase super-critical steam generator will be equipped with a Selective-Sequence System that includes Vulcan T-30 long retractables with 30 to 37-foot travels, half 'tracts with 19-foot travels. Wall deslaggers and air-preheater cleaner controls will also be used.



Nerve center for precision boiler cleaning, the SSC-120 Selective-Sequence Controller is pre-wired and factory assembled for positive control. It handles up to four cycles for each blower. A 60-station model is also available.

Vulcan soot blowing system saves steam, air and manpower

A Vulcan Selective-Sequence System gives the operator the ultimate in finger tip control of *individual* soot blowers. He can set up a sequence to assure thorough boiler cleaning and forget it. He can monitor the program at a glance, stop it, restart it or change any soot blower from any point in the sequence to another to improve cleaning or conserve the blowing medium. Here's complete flexibility without extensive time consuming wiring and piping changes.

Besides Selective-Sequence, Vulcan also builds Automatic-Sequential Systems that can use steam and/or air without a change in equipment, and can provide both simple automatic or manual control.

A complete line . . . a complete service

Over 50 years of design experience backs Copes-Vulcan's broad line of control systems for boiler cleaning, combustion, feed water, pressure reducing and desuperheating.

Whether furnished in individual units or integrated into a single system, each installation gets custom design, skilled continuing service. Trained service men help set up a routine inspection-maintenance program . . . visit each installation periodically.

Bulletin 1029 details Vulcan Automatic Soot Blowing Systems. Write for your copy today.

Copes-Vulcan Division
BLAW-KNOX COMPANY
Erie 4, Pennsylvania

McCune Made AIF President

McCUNE

Francis K. McCune, General Electric Co vice president and general manager of its Atomic Products Division, has been elected president of the Atomic Industrial Forum, Inc. He has been a Forum vp since 1953.

Reelected vice president was E. W. Mills, president, Foster Wheeler Corp. New vice presidents include: J. F. Fairman, vp, Consolidated Edison Co, and William Webster, vp, New England Electric System.

New directors for three years: E. L. Lindseth, president, Cleveland Electric Illuminating Co. and C. R. Weaver, vp, Westinghouse Electric Corp.

NORTH BIRGET SANFORD WESTRATE

North Heads Commonwealth Services

Commonwealth Services Inc has elected J. R. North president. He succeeds J. H. Foote, who is retiring.

The company has also named the following vice presidents: C. D. Birget and F. E. Sanford.

Foote has been appointed director of engineering for Commonwealth Services Inc, parent company of Commonwealth Associates of which he has been vice president and director since 1949. He will continue to function as chief engineer of Commonwealth Associates in addition to his new duties.

North joined Commonwealth Service in 1924. He has been executive engineer since 1956, and a vice president since 1949. He has served as vice president and director of the AIEE.

Birget will continue as chief mechanical engineer of Commonwealth Associates.

Sanford will be director of business development, and will also handle assignments as a consulting engineer for the company. He has been with the company since 1949. Befor that, he had been with Cincinnati Gas & Electric Co.

M. C. Westrate, recently appointed chief electrical engineer, was also named a director of Commonwealth Associates, after the annual stockholders meeting increased the company's board from six to seven members.

W. B. Tippy, president of Commonwealth Services, has announced that North, who is director of Commonwealth Services, will be named a vice president of that firm at its directors' meeting in December.

(More News About People on page 112)

ALLIS-CHALMERS

ALLIS-CHALMERS

NEW brochure of ideas for modernizing

This booklet is based on the premise that modernization can start anywhere in your plant. It can be a single machine or operation . . . a better way of getting variable speed . . . a faster way to braze . . . or a newly available replacement. In fact, this type of updating is far more common than the sweeping change.

Get a copy of "59 ideas for modernization in '59" from your nearby A-C office or write Allis-Chalmers, Industries Group, Milwaukee 1, Wisconsin.

New motor development may eliminate premiums you've been paying for specially protected motors.

Electrical modernization includes placing substations close to machines being served.

ALLIS-CHALMERS

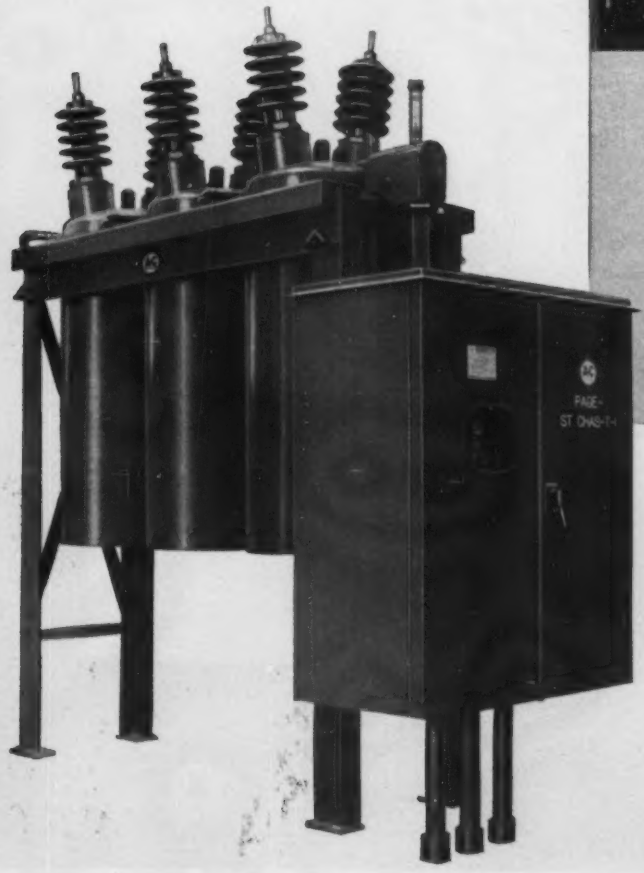
A-5850

for
reliability

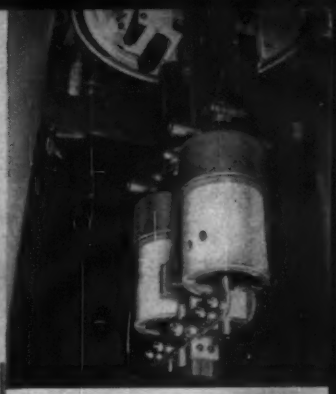
for ease
of maintenance

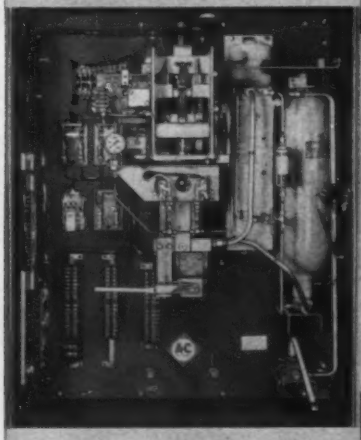
for ease
of operation

...3 top breaker features



❶ Fast contact opening and closing proved by time and laboratory tests. *Turbo Ruptor* device features bayonet and segmented tulip for wiping action, positive contact and absorption of mechanical impact.





❷ Simple design, with few moving parts . . . the *Pneu-Draulic* operator offers many advantages. Dust, dirt, moisture, heat and cold are no problems. Field-proved in dozens of utilities.

❸ Full access to tanks and contacts unobstructed by framework. In addition, optional power-operated hydraulic tank lifter eliminates hand cranking, makes it safe and easy to lower and raise tanks.

Allis-Chalmers large frame-type breakers have many quality features

Careful attention was given to every detail of design and construction. The result: today's top breaker value!

In addition to the features pictured above, you'll find self-cleaning, smooth, fabricated steel tops for each tank; ball-type position indicator visible from greater distances; float-type oil gauge that eliminates leakage; full tank skirt for added stability when tank is on ground.

For details, contact your nearby A-C office or write for Bulletin 71B8475. Allis-Chalmers, Power Equipment Division, Milwaukee 1, Wisconsin.

A-C ALLIS-CHALMERS

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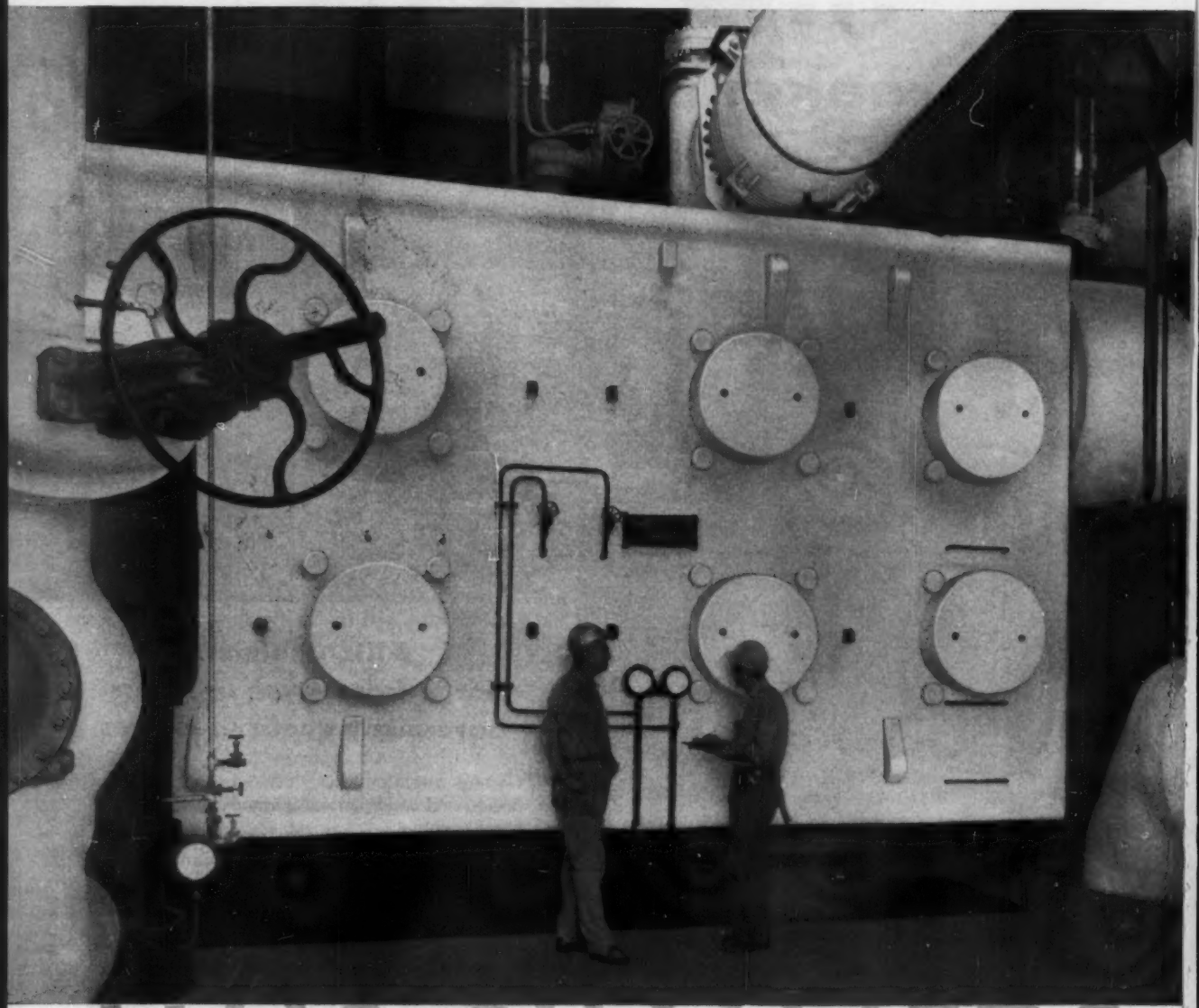
ALLIS-CHALMERS

Pneu-Draulic and *Turbo Ruptor* are Allis-Chalmers trademarks.

ALLIS-CHALMERS

Another Example of Allis-Chalmers

One-half of the twin condensing unit, together with 67,000-gpm circulating water pump, in service at Waukegan Station Unit No. 7 since June 11, 1958.



ALLIS-CHALMERS

Condenser Leadership

180,000 square foot condenser

. . . largest in operation

First 325-mw turbine in operation served by A-C condenser at Commonwealth Edison, Waukegan Station.

This single-pass, twin condensing unit, with its 180,000 square feet of surface, breaks a record for size originally established by Allis-Chalmers units built in 1927 (also for Commonwealth Edison at State Line Generating Station).

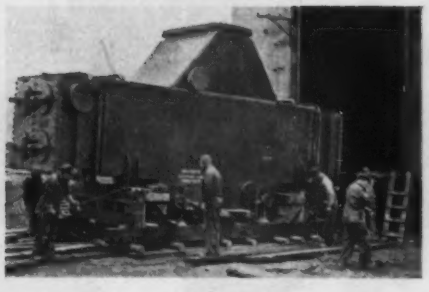
Of special interest to utility men is the use of aluminum tubes. Over 20,000 of these tubes went into this condenser.

Condenser shells are connected to maintain balanced conditions. In addition, the divided water boxes are connected so that any combination of one or more circulating pumps will operate the condensing plant.

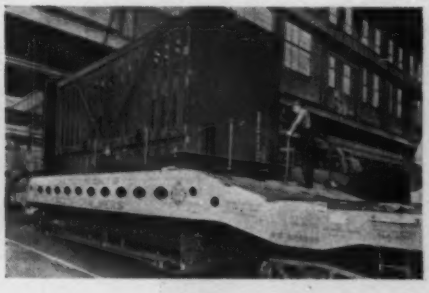
The four circulating pumps and three condensate pumps, as well as motors, were also built by Allis-Chalmers.

Allis-Chalmers has the experience, the facilities, and the backup of auxiliary equipment to meet your special problems.

Get information! Call your nearby A-C office, or write Allis-Chalmers, Power Equipment Division, Milwaukee 1, Wisconsin.



First condenser for first commercial-type nuclear power plant in operation is Allis-Chalmers 5300-sq-ft unit with aluminum tubes, double tube sheets, special leak tightness.



First with specially built "well-center" freight cars to accommodate large condenser sections, thereby reducing shipping problems, cutting installation time and costs.

First welded tube condenser prevents condensate contamination, meets problems of supercritical pressure.

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Allis-Chalmers—25 Years

new

3-Phase POWER Regulators

Save 33% space...
30% cost...20% weight!

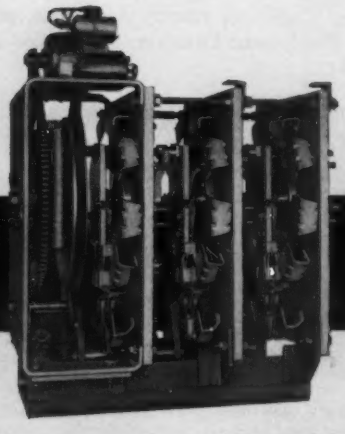
New design — new benefits to utilities are incorporated in the *NEW* Allis-Chalmers 3-phase power regulators.

- Now, substation space requirements for power regulators are reduced by at least one-third.
- Now, reduced sizes and weights for easier handling, lower installation cost.
- Now, cost per kva of 3-phase regulators is reduced 30%.
- Now, 600-amp maximum *Vari-Amp* rating is provided.

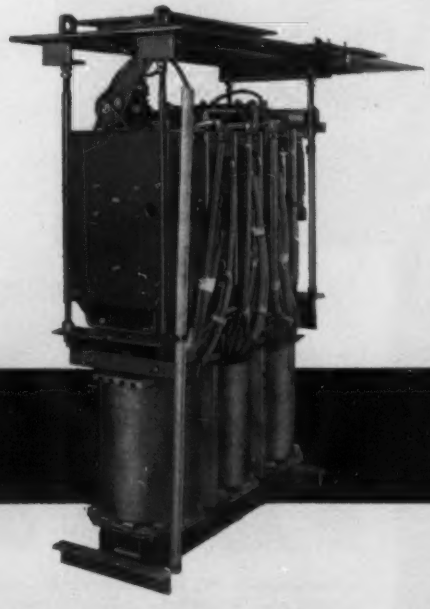
Available in most popular ratings

These new Allis-Chalmers power regulators are rated 500 and 750 kva, 8660 volts, and 500, 750 and 1000 kva, 13,200 volts.

These savings are so important it will pay you to re-evaluate your present substation planning on the basis of these new units. Check with your nearby A-C office or contact Allis-Chalmers, Power Equipment Division, Milwaukee 1, Wis.



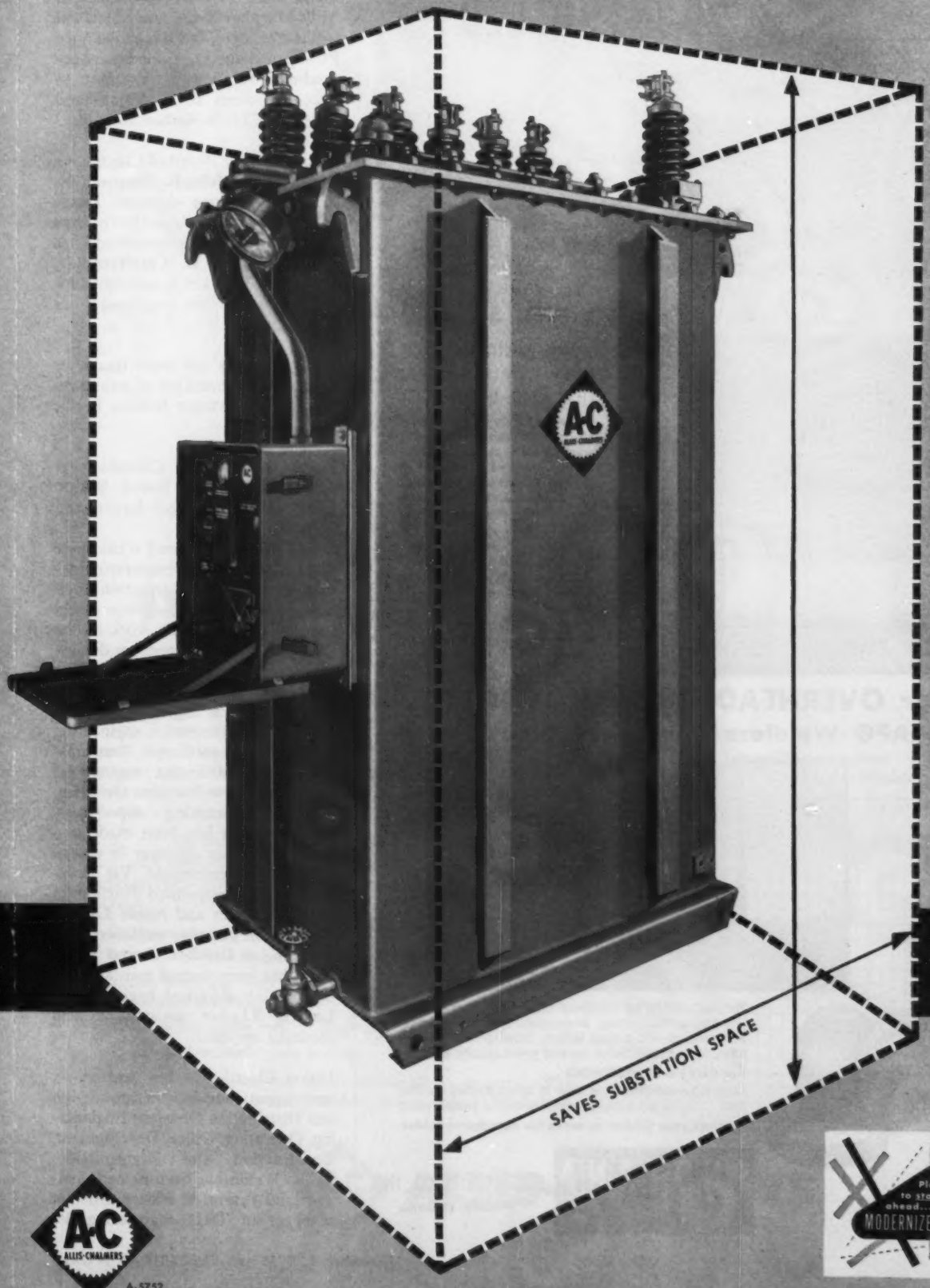
Heavy-duty tap-changing mechanism.



Unit construction combined with new space-saving arrangement of tap-changing mechanism.

ALLIS-CHALMERS

of Leadership in 5/8% Regulators



A-C ALLIS-CHALMERS

A-5752

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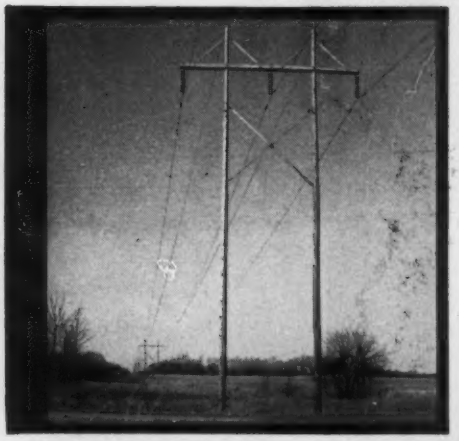
GALVANIZED STEEL STRAND

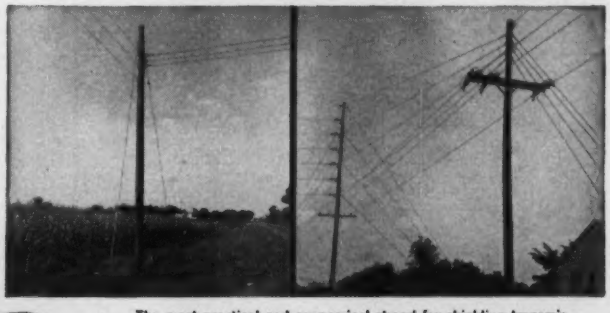


YOUR ASSURANCE OF HIGH QUALITY, LONG LIFE AND LOW COST

Close laboratory control over each step in manufacture has established Crapo Galvanized Steel Strand as a product of highest quality and dependability. You benefit through longer service life and lower ultimate costs.

Heavy, uniform, tightly-bonded coatings of commercially pure zinc, applied by the famous Crapo methods, withstand the punishment of construction, provide maximum resistance to corrosion and contribute to over-all economies.

For OVERHEAD GROUND WIRE . . .
CRAPO Weldless Galvanized Steel Strand



The most practical and economical strand for shielding transmission lines against lightning. Maximum strength and high fatigue endurance, inherent in Crapo Weldless Strand, provide that extra safety factor so important in overhead ground or static wire.

For GUYS and MESSENGER . . .
Crapo Galvanized Steel Strand. Made to highest standard specifications . . . a size and breaking strength to meet all practical needs.

Contact your jobber or write for descriptive folder.

INDIANA STEEL & WIRE CO., INC.
Muncie, Indiana

PERSONAL BRIEFS

Arkansas Power & Light Co has made these executive changes: **W. Mills Murphey** to executive assistant to the President and Executive Vice President Paul O. Canaday. Succeeding Murphey as assistant to Vice Presidents H. F. Minnis and C. Allon Clift is **Arthur E. Ray.**

Electric Power Board of Chattanoga has promoted **John H. Harrison, Jr,** to general service engineer. **James C. Barker** will replace Harrison as superintendent of the overhead lines department. **L. B. Crantford, Jr,** will succeed Barker as assistant superintendent of the overhead lines department.

John H. Clark has been made assistant to the manager of public relations for Northern Indiana Public Service Co.

Massachusetts Tax Commissioner **J. P. Healey** has joined Boston Edison Co in its legal department.

Commonwealth Edison Co has made these changes in the engineering department: A new distribution engineering department has been establishd to take over the work of the former project engineering department and distribution activities transferred from system planning, station electrical engineering, transmission and distribution engineering and drafting departments. Transmission and Distribution engineering department now becomes the transmission engineering department. **John Bracken** has been made system distribution engineer in charge of the new department. **Vic Bernthal** has been appointed distribution design engineer and **Noble Larson,** distribution planning engineer, both reporting to Bracken. **Ernest Michelson** has been named assistant system station electrical engineer and **Ludwig Lischer** assistant system planning engineer.

Union Electric Co has created six new departments in its Transmission and Distribution Division: Engineering, Operating, Office, Development, Construction and Transmission. **M. R. Wallin** has been named manager and **Ernest A. Fisher** assistant manager of T&D engineering de-

ALLIS-CHALMERS

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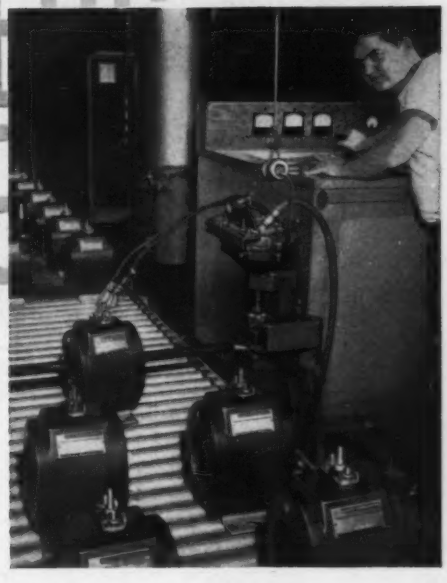


Now Available . . .

18 types of cast epoxy resin instrument transformers

To meet industry's growing demand for these superior quality instrument transformers, Allis-Chalmers has instituted a program of developing a number of new types for various applications — and has more than doubled previous production capacity.

No Maintenance — Easily Installed

Epoxy resin, virtually a miracle material, gives transformers complete protection—both electrical and mechanical—either outdoors or indoors.

Allis-Chalmers epoxy resin transformers:

1. Have excellent dielectric properties.
2. Can withstand wide temperature variations and severe mechanical shocks.
3. Are maintenance free . . . require no painting, resist solvents.
4. Can be installed in any position — quickly, easily.

Your A-C man will give you the complete story, or write Allis-Chalmers, Power Equipment Division, Milwaukee 1, Wisconsin.

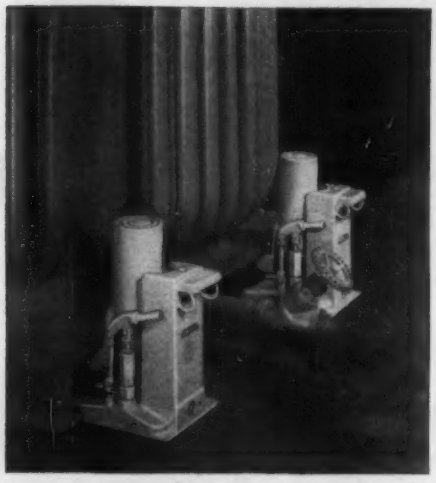
Types of epoxy resin cast transformers available

Type	INDOOR	OUTDOOR	INSULATION CLASS	CURRENT RATINGS (AMPERES) 10-5	15-5	25-5	40-5	50-5	75-5	100-5	150-5	200-5	300-5	400-5	600-5	800-5	1000-5	1200-5	1500-5	2000-5	3000-5	4000-5
BKM	X	X	600														X	X	X	X	X	X
LM	X		600														X					
MM	X	X	600										X		X							
TWM	X	X	600										X		X	X	X					
BKIM	X		5000															X	X	X	X	X
BKAWIM	X	X	5000															X	X	X	X	X
BKWDIM	X	X	5000															X	X	X	X	X
BKM PLUG KIT	X	X	5000															X	X	X	X	X
LBM 45-KV IMPULSE	X		5000	X	X	X	X	X	X	X	X	X	X	X	X	X						
LDM 45-KV IMPULSE	X		5000	X	X	X	X	X	X	X	X	X	X	X	X	X						
TWM PLUG KIT	X	X	5000										X		X	X	X					
BK2M	X		8700															X	X	X	X	X
BKAW2M	X	X	8700															X	X	X	X	X
BKWD2M	X	X	8700															X	X	X	X	X
BK3M	X		15000															X	X	X	X	X
BKAW3M	X	X	15000															X	X	X	X	X
BKWD3M	X	X	15000															X	X	X	X	X
K3M	X		15000	X	X	X	X	X	X	X	X	X	X	X	X	X	X					

A-5814

ALLIS-CHALMERS

Unique Transformer Jack Lifts Full Capacity on Toe or Cap



Exclusive design accounts for the success of this series of jacks. The roller bearing in the toe transmits eccentric toe loading to the flat milled surface on the stationary ram. This completely eliminates scoring action which is inherent in conventional toe lift hydraulic jacks. Lifts full capacity on both the toe or the cap.

Double pumps provide both speed and power. A safety by-pass prevents overloading. Ideal for lifting heavy machinery and transformers with minimum jacking clearances. Can also be used horizontally. Write for catalog.

Jack No.	Capacity Tons	Weight Lb.	Closed Height Inches	Travel Inches	Toe	Base: Forked Design
TJ-10	10	54	11¾	6	Min. Ht. 1¾" Width 3"	9½"x8"
TJ-25	25	110	14	7	Min. Ht. 2½" Width 4½"	9"x12"
TJ-50	50	230	18	10	Min. Ht. 3½" Width 5½"	11½"x14¼"

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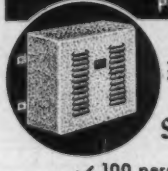

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partment. In the T&D operating department **William R. McMillan** has become manager and **Gordon W. Gerell** has become his assistant. **Arthur E. Tehlenberg** has become manager of the office department and **Charles E. Monfort, Jr,** will become manager of the construction department. **George W. Couch** has been named manager and **Henry C. Colteryahn** assistant manager transmission department. **Oscar J. Rotty** was appointed manager T&D development department. **Thomas J. French** will continue as T&D personnel supervisor.

Julian Bolton has been promoted to customer service representative at Southwestern Electric Service Co.

Telluride Power Co, a subsidiary of Utah Power & Light Co, has made **Jay F. Gardner** business development manager.

Frederick G. Sandstrom of Consolidated Edison Co of New York's electrical engineering department has won the Distribution Achievement Award of the American Gas Association.

Atlantic City Electric Co is consolidating its Northern and Southern Divisions into the Coastal Division. **William DeLong** will be division manager, **Thomas B. Hamm** district manager of the Wildwood Area and **Robert K. Hunter** acting district manager of the Ocean City Service Area.

OBITUARY

Marshall E. Lake, 57, vice president of Duke Power Co, died recently after a brief illness in Charlotte, N. C.

Ralph W. Pierce, founder of the former Otterbein Power & Light Co, Otterbein, Ind., died on Nov. 7.

Louis A. Lonsway, 60, district manager for the Ohio Power Co, died Nov. 11 in Cleveland.

Ray W. Turnbull, 68, retired western region vice president of General Electric Co and one-time president of GE's Hotpoint Division, died Nov. 8 following a heart attack.

Shock and Burn EEI Topic

(*Continued from page* 82)

ment of a capacitor-type defibrillation device adaptable for field use.

• Gratification was apparent at the announcement that contractors and utility companies were using radiation safety devices and complying with Atomic Energy Commission precautions is handling radioactive materials, especially cobalt units for checking wells and high-pressure boilers.

• There was a consensus for continuing the monthly safety package, containing a letter to foreman, posters, and handouts for the crew.

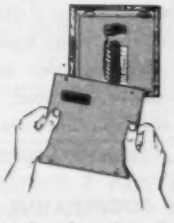
Members of the new Atomic Plant Safety Task Force, announced at the meeting, are: M. C. Beekman, Detroit Edison Co; E. A. Blomquist, Consolidated Edison Co; R. J. Owens, Pacific G&E Co; A. C. Werden Jr, Southern California Edison Co; and G. M. Oldham, Duquesne Light Co.

F. W. Jones, Gulf States Utilities, showed slides of new safety equipment items. These included a device for use with a hot stick, enabling one man to install Ubangi hose; insulated tool handles of proved high dielectric strength; plastic face shields which molten metal will not penetrate; a gas-driven generator that can be front-mounted on a line truck for powering tools in the field; a cartridge-size snake-bite kit for linemen; and various types of insulated blocks for handling live conductors.

Bremner introduced the film, "Respiratory Resuscitation Methods," produced by the Walter Reed Hospital, which stresses the superiority of mouth-to-mouth methods over those generally considered to be less "esthetically" objectionable. R. H. Coleman said that mouth-to-mouth resuscitation will probably be designated the approved method for adults, as well as children, by the American Red Cross.

W. B. Kouwenhoven M.D., professor emeritus, John Hopkins University, reported that a defibrillation device of hospital proportions has restored the action of more than 400 human hearts. A smaller, capacitor-type device for field use, he said. is now considered a distinct possibility and, as already developed in the laboratory, has proved successful on dogs.

1. Central control cabinet is eliminated.



2. Loudspeaker Amplifiers and Handset Stations are "plug-in". Untrained personnel can replace a defective unit with a "spare" in minutes. Repairs can be made at the shop bench.

3. The inconvenience and expense of vacuum tube failure is completely eliminated. Unlike vacuum tubes, transistors indicate unlimited life and no deterioration in operation.

4. Because of transistors' much lower voltage requirements, GTC operates with much greater safety factor than vacuum tube equipment.

5. Ultra-simple wiring plan (no shielded cables used).

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Director of Utilities—City of 27,000 in Eastern North Carolina. Steam generation plus purchase power. Under City Manager has charge of Electric-Water-Sanitary and Storm Sewer systems. Graduate Engineer or equivalent with at least 10 years experience in Municipal affairs. Want complete resume and salary expected. Superintendent of Power Plant—Modern coal burning plant. Graduate Engineer or equivalent experience. Address: City Manager, Kinston, North Carolina.

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250	G.E.	440	250
200	WEST	2300/4600	250
200	G.E.	2300	250/275
200	RDGWY	2300	250
150	AL-CH	2300	250/275
150	G.E.	440	250/275
150	WEST	2300/440	250/125
125	G.E.	5000	250
125	WEST	2300	250
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The Meetings Calendar

JANUARY - 1959

International Home Furnishings Market — The Merchandise Mart, Chicago, Ill., Jan. 5-16.

Edison Electric Institute—Industrial Power & Heating Group, Atlanta, Ga., Jan. 15-16.

• **Joint Edison Electric Institute** Industrial Relations Committee —Personnel Practices Committee of the **Pennsylvania Electric Association**—Carlton House, Pittsburgh, Pa., Jan. 15-16.

• **American Institute of Electrical Engineers**—Winter General Meeting, New York City, Jan. 19-23.

• **Pennsylvania Electric Association**—Communications Committee, Jan. 22-23; System Operation Committee, Johnstown, Fort Stanwix Hotel, Jan. 29-30.

• **American Society of Engineering Education**—Industry Division, 11th National College—Industry Conference, University of Houston, Jan. 26-27.

American Society of Heating & Air Conditioning Engineers—14th International Heating & Air-Conditioning Exposition, Convention Hall, Philadelphia, Pa., Jan. 26-29.

Canadian Electrical Association—Eastern Zone Section Meetings, Chateau Frontenac, Quebec, P. Q., Canada, Jan. 26-29.

Doble Clients Conference—26th Annual Meeting, Sheraton Plaza Hotel, Boston, Mass., Jan. 26-30.

• **Midwest Welding Conference**—5th Annual Conference sponsored by Armour Research Foundation of Illinois Institute of Technology and the Chicago section of the American Welding Society, Chemistry Building, Illinois Tech campus, Jan. 28-29.

Public Utilities Advertising Association — Regional Meeting, Timberline Lodge, Portland, Oregon, Jan. 29-30.

FEBRUARY

American Institute of Electrical Engineers—Winter General Meeting, Statler and Sheraton-McAlpin Hotels, New York City, Feb. 1-6.

• **Edison Electric Institute**—Prime Movers Committee, Feb. 2-4; Transmission & Distribution Committee, Morrison Hotel, Chicago, Ill., Feb. 12-13; EEI-AGA Accounting Conference, Final Working Committee, Lord Baltimore Hotel, Baltimore, Md., Feb. 16-17, Electrical System & Equipment Committee, Atlanta Biltmore Hotel, Atlanta, Ga., Feb. 16-17.

Pennsylvania Electric Association—Transmission & Distribution Committee, Feb. 5-6; Prime Movers Committee, Pittsburgh, Pa., Feb. 12-13; System Planning Committee, Philadelphia, Pa., Feb. 16-17; Electric Equipment Committee, Philadelphia, Pa., Feb. 19-20; Relay Committee, Pittsburgh, Pa., Feb. 26-27.

Missouri Valley Electrical Association—Industrial and Commercial Sales Conference, President Hotel, Kansas City, Mo., Feb. 5-6.

• **National Association of Purchasing Agents**—Public Utility Buyers Group Mid-Winter Meeting, Feb. 8-10.

National Electrical Week—February 8-14.

National Rural Electric Coop Association — Annual Meeting, Shoreham and Sheraton-Park Hotels, Washington, D. C., Feb. 9-12.

• **American Society of Civil Engineers Convention** — Los Angeles, Calif., Feb. 9-13.

• **Pacific Coast Electrical Association**—Business Development Conference, Hotel Sheraton-Palace, San Francisco, Calif., Feb. 12-13.

• **American Institute of Mining, Metallurgical, and Petroleum Engineers, Inc.**—Annual Meeting, Hotels St. Francis, Sheraton-Palace, Sir Francis Drake, San Francisco, Calif., Feb. 15-19.

• **Electrical Trade Conference & Exposition** — Sheraton Park Hotel, Washington, D. C., Feb. 17-19.

• **American Public Power Association**—Engineering & Operations Workshop, Springfield, Illinois, Feb. 19-20.

• **National Society of Professional Engineers**—Winter Meeting, Dinkler-Tutwiler Hotel, Birmingham, Alabama, Feb. 19-21.

• **California Municipal Utilities Association**—Annual Conference, Berkeley, California, Feb. 24-27.

• **Public Utilities Advertising Association**—Regional Meeting, New Haven, Connecticut, Feb. 26-27.

• Additions this week.

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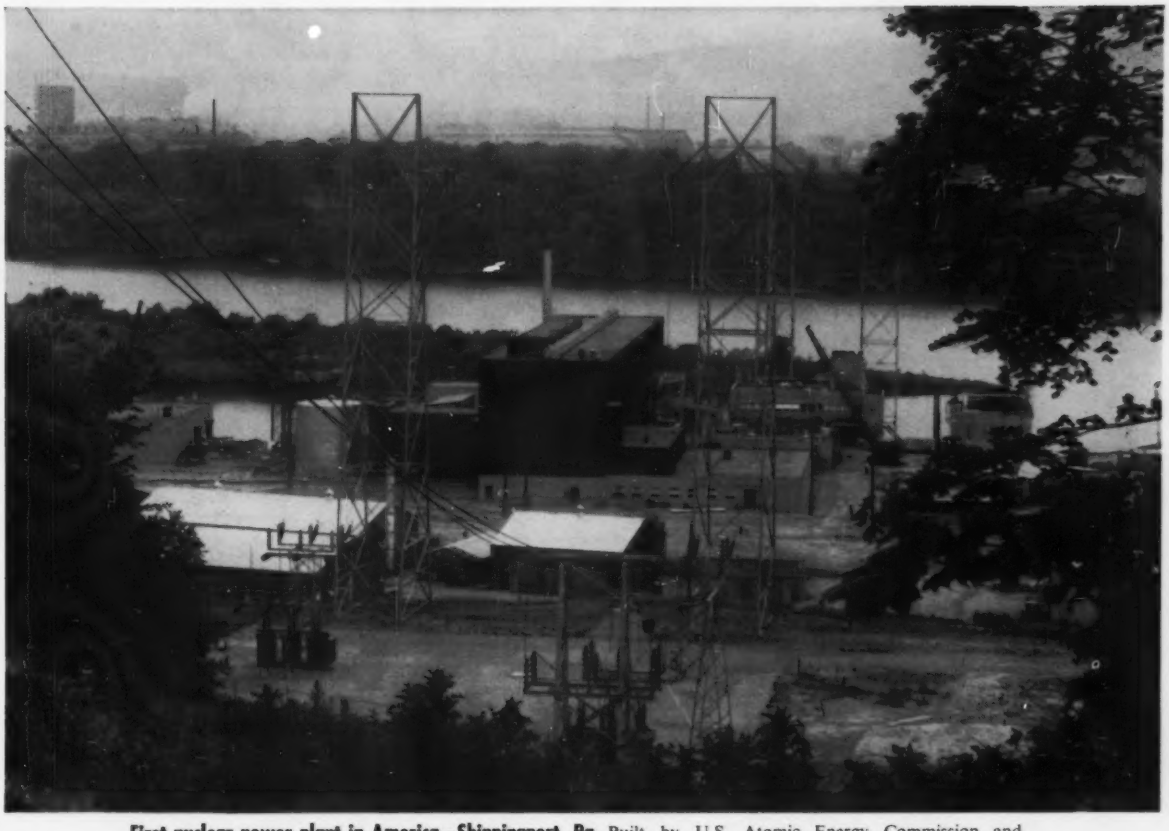

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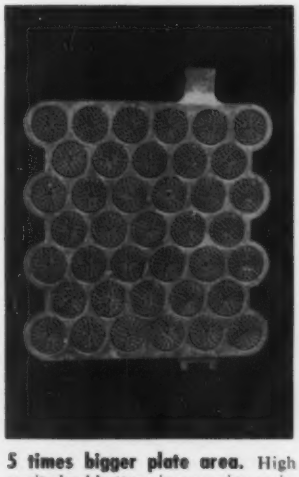

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